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HYGIENE FOR GIRLS

Florence Harvey Richards M.D.

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HYGIENE FOR GIRLS

INDIVIDUAL AND COMMUNITY

BY

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To

My Father and Mother

WHOSE SELF-SACRIFICE AND ENCOURAGEMENT
MADE POSSIBLE MY MEDICAL EDUCATION,
THIS BOOK IS AFFECTIONATELY DEDICATED

INTRODUCTORY NOTE

The last few years have witnessed a remarkable revolution against the old idea that it was the chief function of the school to impart a knowledge of many things. The newer conception of education emphasizes the necessity of developing habits that will bring out the best possibilities of the individual both physically and mentally.

Following this new belief in an education that really meets human needs has come an intense interest in the physical welfare of the individual and the community. So the old text-books with their exhaustive discussions of anatomy and physiology are disappearing, and their place is being taken by manuals that give the young the instruction most needed to enable them to build up normal, healthy lives.

The present volume, I believe, furnishes an admirable basis for this instruction. It is founded on the author's successful experience as a physician, supplemented by her large knowledge of the actual demands of the class room. Her rare opportunity to know youth intimately in a school of over two thousand pupils, where she is looked upon as the mentor in all physical matters, has given her unusual fitness for the preparation of this admirable book.

WILLIAM D. LEWIS.

The William Penn High School,
Philadelphia.
June 27, 1913.

PREFACE

This text-book has for its foundation a series of lectures delivered to the freshman class of the William Penn High School for Girls. The author has always contended that the modern text-book on physiology contains too much physiology and not enough practical Hygiene. In the preparation of this book, therefore, just enough Anatomy and Physiology have been introduced to give the pupil a groundwork for the principles of Hygiene. When an extended course cannot be given in this subject, it is more desirable for pupils to know why milk is such a nourishing food, what shoes are hygienic and why, how to act in such emergencies as fainting, nose-bleed and drowning, how germs cause disease, and how to use disinfectants, than to acquire a mass of unnecessary information concerning the circulation of the blood, the coats of the stomach, the construction of the eye-ball or the arrangement of the various parts of the brain. The author has endeavored to apply information to the every-day life of the pupil and to correlate the laws of health with physiological facts.

The effect of alcohol has been considered more from the sociological viewpoint than from that of the physician or moralist. Pupils are more interested in the relation of alcohol to wages and conditions, to unhappy homes and degenerate children, to crime and Juvenile Courts, than they are in the actual effects of alcohol on physical health.

The chapter on emergencies will enable any pupil to act promptly and intelligently in those situations, which come unexpectedly to all, where instant knowledge of the proper thing to do may mean the saving of valuable lives.

Patent medicines are used so generally throughout the United States that it was thought advisable to devote an entire chapter to the study of this subject. Only by educating the young to know the tremendous harm wrought by patent medi-

cines, the waste of money and the loss of valuable time in the treatment of disease, can we hope to materially lessen the consumption of nostrums and cure-alls

Special attention has been given to the germ theory of disease, the modes of transmission of infectious diseases, and especially of their prevention. Pupils should know that typhoid fever is caused by a polluted water supply; that vaccination for smallpox and typhoid fever is beneficial and not harmful; that flies carry the germs of many diseases, and that it is a reproach to modern sanitation to allow such filthy insects access to our homes. A whole chapter is devoted to the study of tuberculosis, the "great white plague," with special stress laid upon the necessity of early treatment and prevention.

The need for instruction in sex hygiene in the schools is at present receiving widespread attention. While the author believes that such knowledge should be imparted primarily by parents, the regrettable fact remains that many parents are either ignorant themselves, or have a peculiar false modesty when called upon to teach their children the phenomena concerning the significance and health of the reproductive organs. In view of the fact that morals have their foundation in life processes and can be taught adequately only with reference to these processes and, moreover, that human life is governed by fixed laws, ignorance or transgression of which is bound to bring swift and certain punishment, the duty of the educator in this respect can no longer be ignored. The author, therefore, after much consideration and forethought, has added the chapter on the reproductive organs, with the hope that both teachers and pupils will accept it in the spirit in which it is written and profit by the instruction contained therein.

This volume is arranged to cover about one year's instruction in the higher grammar grades or in the first year of High Schools. Many of the illustrations are new and have been gathered from original sources.

FLORENCE HARVEY RICHARDS.

Philadelphia, Pa., August, 1913.

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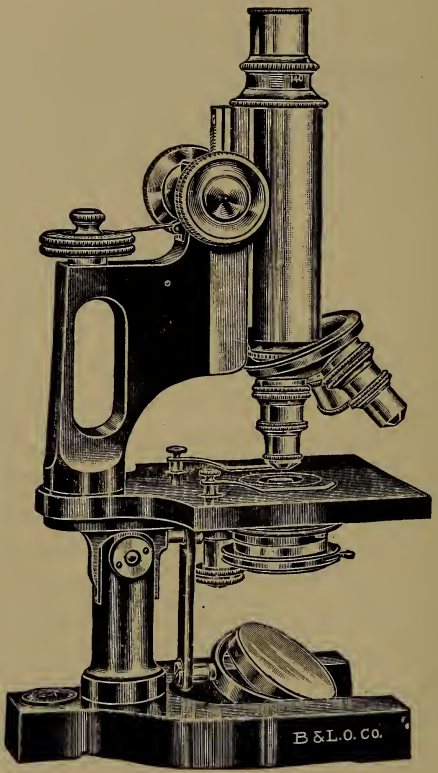


A MICROSCOPE

HYGIENE FOR GIRLS

PART ONE

INDIVIDUAL HYGIENE

I.—INTRODUCTION.

Anatomy is the science which treats of the actual structures of the various parts of the body and their relations to each other. It explains the structure of the bones, muscles, blood vessels, nerves, and lymphatics, and of the various organs of the body. A knowledge of anatomy is necessary in order to understand Physiology and Hygiene.

Phys ology is the science which treats of the functions of various parts of the body, their properties and actions. It explains the circulation of the blood, the digestion of food, the process of breathing, the control of the brain and spinal cord over the muscles, etc.

Hygiene is the science which treats of the preservation of health and the prevention of disease.. It explains why we should be clean in our persons, in our homes, and in our relations as a community. Hygiene also explains how to avoid infectious diseases, how to prepare our food properly, etc. Health is wealth, and a sound mind is found only in a sound body. Sickness is expensive, and to know how to prevent it is worth thousands of dollars yearly to any State.

Much illness in later life is due to indiscretions in youth.

Huxley says, "Young people should so learn Physiology and Hygiene, and so understand their bodies, that they will heed the first sign of Nature's displeasure and not wait for a box on the ear." A proper understanding of the care of the body and the value of fresh air, pure food, exercise, and rest, will go a long way toward laying a substantial foundation for the making of strong, healthy, and happy citizens.

CELLS, TISSUES, ORGANS AND SYSTEMS

Cells, Tissues, Organs and Systems.— A *cell* is the smallest particle of animal or vegetable matter. It eats and secretes, grows, moves, and reproduces. The amœba is a good example of a one-celled animal. It is made up of a transparent, jelly-like substance called *protoplasm*, containing a speck called the *nucleus*, which is usually surrounded by a wall called the *cell wall*.

FIG. 1. — The amœba, a one-celled animal.

Cells of one kind reproduce themselves and finally form the various *tissues* of the body. These may be classified as *connective*, *osseous* or *bony*, *cartilaginous*, *muscular*, *nervous*, *epithelial*, and *nutritive*.

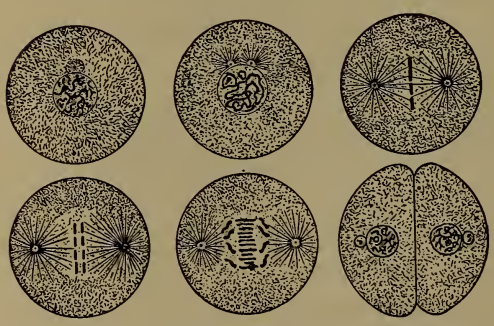


FIG 2.— Steps in cell-division (after Wilson). Note that the process begins with the division of the attraction sphere, then involves the nucleus and finally separates the main body.

Connective Tissue.— This is the most widely distributed of all the tissues. There are many varieties, the most common of which are the following:—

Areolar: The groundwork of all organs.

White fibrous: Long, tough threads which help to bind other tissues together. It is the chief part of tendons, ligaments, etc.

Adipose or fatty: Globular cells found under the skin, forming the fat and giving roundness to the outlines of the body. Under the eye-ball these globular cells act as a cushion.

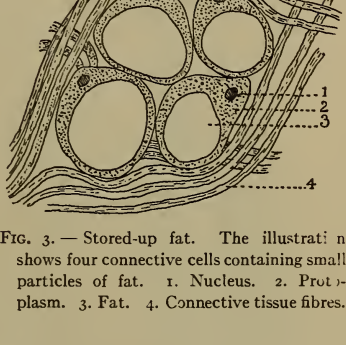


FIG. 3. — Stored-up fat. The illustration shows four connective cells containing small particles of fat. 1. Nucleus. 2. Protoplasm. 3. Fat. 4. Connective tissue fibres.

Osseous or Bony Tissue.— This is dense, hard material, forming bone.

Cartilaginous Tissue.— This is a somewhat yielding tissue, not quite so hard as bone, found in the joints at the ends of the long bones, in the ears and in the end of the nose. All bones have once been cartilage.

Muscular Tissue.—This is the meat of the body. Muscle fibres are capable of contracting, thus making themselves shorter.

Nervous Tissue.—The brain, the spinal cord, and nerves are formed of nervous tissue.

Epithelial Tissue.— This tissue covers the body and lines the alimentary canal and other tubes in the body.

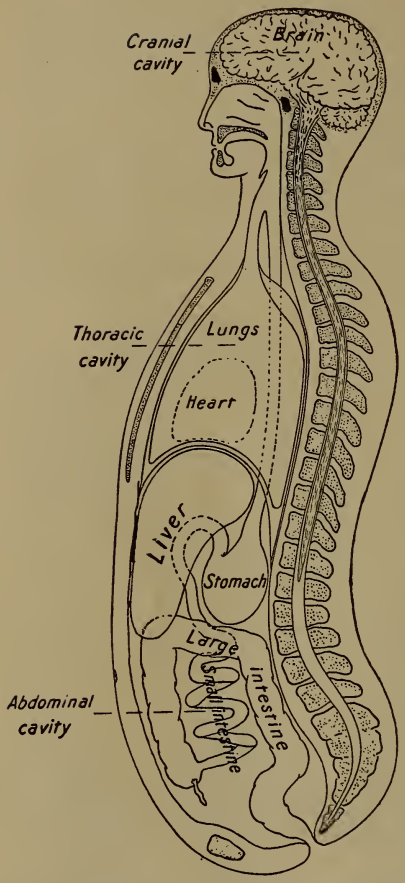


FIG. 4.— Diagram of a lengthwise section of the body to show its large cavities and the organs which they contain.

Nutritive Tissue. — This is a liquid tissue found in the blood and lymph.

An organ consists of a group of tissues joined together for a special purpose. The heart, the lungs, the kidneys, the brain, are organs.

A System.— A number of organs associated together for a special purpose constitute a system. Examples: *Digestive*, *circulatory*, *nervous*, *respiratory*, *muscular*, *osseous*, *excretory* and *reproductive* systems. All the systems must be in perfect working order to insure good health.

Any dislocation of, or functional disturbance in the organs of any one system will upset this perfect balance, and ill-health will result.

II.— THE MUSCULAR SYSTEM.

PHYSIOLOGY OF THE MUSCULAR SYSTEM

The Muscles are the lean meat of the body. Their function is to move the different parts of the body and to assist organs to perform their work. There are two kinds of muscles — *voluntary* and *involuntary*. Voluntary muscles are under the control of the will; as, the muscles of the arms and legs. Involuntary muscles are not under the control of the will; as, the heart muscle, the muscles controlling the digestive organs, etc.

Nervous Control of Muscles. — Muscles are controlled by *nerve impulses* from the *brain* and *spinal cord*. When a muscle contracts, it becomes shorter and thicker. Under the microscope, voluntary muscles show cross markings, hence they are called *striated* or *striped fibre*

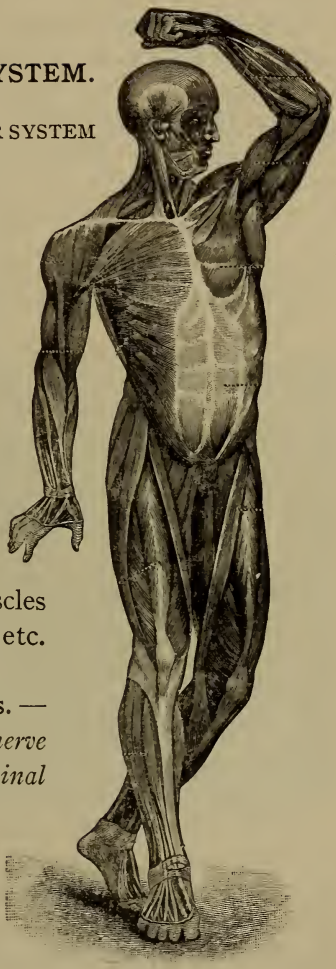


FIG. 5 — The muscles of the body.

muscles. The involuntary muscles are spindle-shaped, and *unstriped*, or smooth.

The heart fibres, though involuntary, are very short, thick, and striped, — an exception to the general rule.

Terminations of Muscles. — Some muscles are attached directly to the bones, but the majority terminate in thick, glistening ends called *tendons*. These may be felt at the back of the knee. Tendons attach the muscles to the bones and are smaller than the muscles, in order to save space.

Functions of Muscles.—Muscles are named from their use, as: (1) *Flexors* and *extensors:* Limbs are bent by the flexors and straightened again by the extensors, (2) *Abductors* and *adductors:* The abductors raise and pull a limb outward, while the adductors draw it toward the body again.

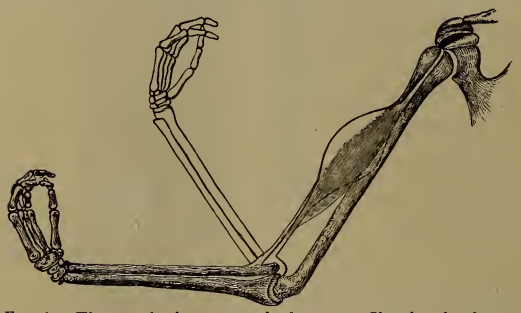


FIG. 6.— The muscle that moves the forearm. Showing the change in the muscle when it causes motion.

(3) The *sphincters* or *ring-like muscles:* These surround certain openings; such as the mouth, the eye, and the end of the rectum or anus.

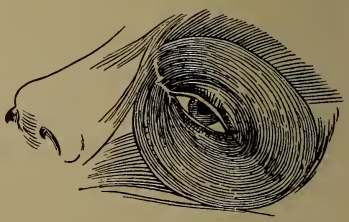


FIG. 7.— The sphincter muscle of the eye.

The Growth of Muscles. — Muscles grow with use. When they are properly exercised, an increased supply of blood flows to them, the cells are fed and multiply, and the muscles grow. If muscles are not used they become flabby and pale; if on the other hand, they are worked too hard, the cells do not have time to feed properly on the increased blood supply and their growth is stopped.

HYGIENE OF THE MUSCULAR SYSTEM

The Value of Exercise. — The contraction of muscles all over the body during vigorous exercise squeezes the

GYMNASIUM OF THE WILLIAM PENN HIGH SCHOOL FOR GIRLS, PHILADELPHIA

lymph and the blood through the veins to the heart, thus improving the circulation and getting rid of waste matter lying dormant in the tissues. Exercise causes deeper breathing, and the increased supply of oxygen in the lungs

purifies more blood, thus providing a larger quantity to be carried to the surface of the body. This induces free perspiration and thus rids the blood of more impurities. Exercise uses up food and creates an appetite for more food.

The desire to exercise is a natural instinct. A baby, if left alone on his bed or blanket, will constantly kick his

A SIX-MONTHS-OLD BABY TAKING EXERCISE.
This exercise was usually taken nightly on the bed before going to sleep.

legs and move his arms in his efforts to exercise. It is not so much overstudy as lack of exercise and fresh air that makes girls and boys break down in the high school.

Round shoulders, flat chests, and prominent abdomens, may be prevented by attention to the matter of correct standing and sitting and judicious exercise. Standing squarely on both feet, the chest should be held high and the chin in, with the back flat and the hips well back. A

graceful walk, with easy swinging arms, should be cultivated.

If the muscles are not used they become weak and flabby. Girls who wear their corsets too tight are always complaining of pains in the back or in the side. These pains are due to the relaxation of muscles weak from disuse.

The Best Exercise. — The best exercise is that which combines some special object to be attained with the exercising of the muscles. The mind is thus stimulated, and consequently muscles and nerves work harmoniously

PLAYING HOCKEY.

together. Thus useful labor and games having some other object than mere exercise, neither over-tax the nerves nor exhaust the will power.

Young persons should be encouraged to play games which take them out into the open air where there is

plenty of oxygen. Tennis and golf, swimming and rowing, climbing trees, vigorous walking, horseback riding, dancing and skating, are all splendid ways of exercising. These games have the advantage of taking one out into the fresh air and sunlight, two powerful factors in improving the health. Indigestion, a sluggish liver, and constipation can be cured by using a proper amount of exercise and fresh air.

If any special set of muscles needs exercising, the gymnasium will provide for these muscles, at the same time leaving overworked muscles at rest. A person employed

GIRLS DANCING THE HIGHLAND FLING IN A NEW YORK SCHOOL YARD.

in a sedentary occupation should have some suitable, regular, outdoor exercise, of the nature of tennis or golf; if this is not available, the gymnasium will answer.

Drilling in the gymnasium with the accompaniment of music, or the learning of folk dances, is an improvement on the ordinary calisthenic work, which as mere exercise tends to become monotonous and tiresome.

In warm climates excessive exercise is harmful, while in cold climates three times the amount of physical work can be accomplished.

Fatigue.—When the material of the muscle cells and nerve cells is used up by exercise, the sensation of fatigue follows. This should be considered a warning to stop. If this warning is not heeded and the body is constantly overworked, nerve tire sets in, resulting ultimately in a general nervous collapse or nervous prostration. Rest is then required, for only during sleep and rest can the muscle cells be built up, ready for more work.

GIRL PROPERLY DRESSED FOR WALKING.

Massage. — *Massage* is passive exercise. Instead of using up the nerve power to direct the muscles, the muscles are moved and pinched and squeezed by some one else. The lymph and blood are moved along, the internal organs are stimulated, and the circulation and respiration are improved. Special training is now given in massage. A

STAR GARDEN PLAYGROUND, PHILADELPHIA

man who gives massage is called a *masseur;* a woman, a *masseuse.*

Massage is invaluable to invalids who are bed-ridden, and therefore unable to exercise themselves. General massage is a firm manipulation of the whole body. This is usually beneficial to most persons, although there are a few con-

ditions in which it is contra-indicated. Special massage is that applied to one locality; for example, it is given to relieve the stiffness about a joint that follows upon a dislocation or inflammation; to relieve stiffness of the neck or back; or to exercise a fractured arm or leg, since the after treatment of a fracture necessitates several weeks' rest on the part of the patient.

Caution. — Exercise should not be taken immediately after a meal; nor should a meal be eaten directly after exercise. Exercise calls the blood to the surface of the body, while digestion requires the blood in the internal organs.

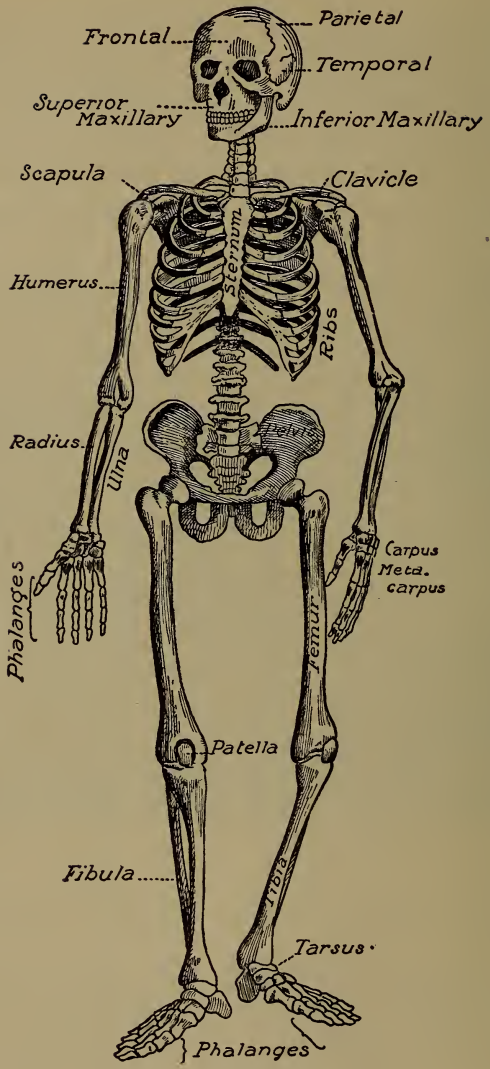


FIG. 8.—The human skeleton.

III.—THE OSSEOUS SYSTEM OR BONY STRUCTURE.

PHYSIOLOGY OF THE OSSEOUS SYSTEM

Use of the Bones.—The bones are for protection, support, and motion. Those which protect are broad and flat; those which support are thick and solid; and those which aid in motion are long and straight.

The Skeleton.— The skeleton is divided into the *skull*, the *trunk*, and the two *extremities*. The skull consists of the *cranium*, which surrounds the brain, and the bones of the face. The trunk consists of the *spinal column* and the *ribs*, the *breast bone*, the *collar bones* and the *hip bones*. Each extremity consists of a single large bone in its upper part, and two large bones in its lower part, ending in a number of smaller bones which form the hand or the foot. The bones of wrist and hand in the upper extremity correspond to the bones of ankle and foot in the lower extremity.

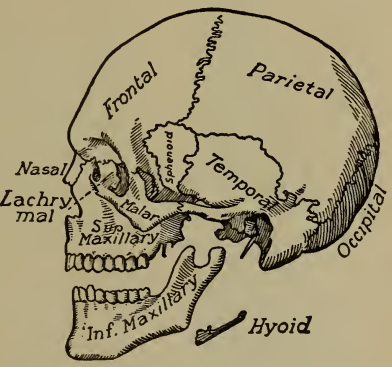


FIG. 9.—The skull (Huxley). The illustration shows most of the bones of the skull.

The spinal column consists of twenty-four *vertebrae*

strung together by cushion-like joints and resting on a large bone, the *sacrum*, which is followed by a small tail-like bone, called the *coccyx* — twenty-six bones in all. A canal through the centre of the vertebrae carries the *spinal cord*. A common and rather serious injury is fracture of the coccyx, caused by a fall from a sled or on an icy pavement, or by the fall of one whose chair is unexpectedly drawn out from under him.

FIG. 10.— The spinal column.

Composition of Bone.—Bone is composed of mineral matter, mostly lime, which makes it hard and solid; and animal matter, like gelatin, which makes it tough and elastic. Burning a bone takes out the animal matter, whereupon the remainder crumbles to the touch; while soaking a bone in acid dissolves the mineral matter, whereupon the bone may be tied in knots.

Gross Structure of Bone. — By this we mean all that is seen with the unaided eye. All bones are covered with a tough connective tissue called the *periosteum*. All bones are hard on the outside and porous on the inside. The growth of the bone takes place under the hard periosteum. Bony tissue may be hard and compact, or spongy. The long bones have a hollow

shaft filled with yellow marrow, composed of blood vessels and fat for nourishment. All the porous parts of the bones contain a red marrow which is extremely important, as red blood cells are here formed.

Development of Bones.—All bones, except a few in the skull, develop from *cartilage* or *gristle*. This hardening substance is easily bent in childhood and the shape of some bones may thus be changed entirely by improper pressure.

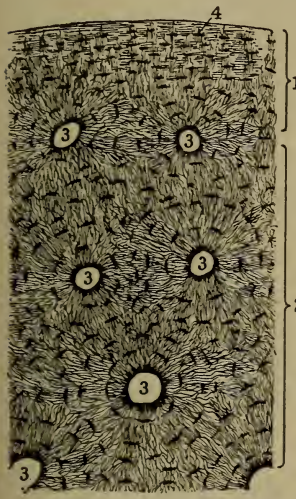


FIG. 11.—Cross section of bone showing minute structure. Magnified. 1. Surface layer of bone; 2, deeper portion; 3, Haversian canals from which pass the canaliculi; 4, a lacuna. Observe arrangement of lacunæ at surface and in deeper portion.

Joints.—The meeting of two bones is called a *joint*. A joint may be movable, as the joint of the elbow or wrist, or immovable, as the joints in the bones of the skull. The most

FIG. 12.—Section of a long bone (*tibia*), showing the gross structure.

important movable joints are the *hinge* joint as in the jaw and knee; and the *ball* and *socket* joint as in shoulder and hip. The ends of the bones forming the joint are covered with beautiful smooth white cartilage, and these bones are held in place by tough bands called *ligaments*. A delicate membrane, lines the joint and secretes a fluid to keep it moist.

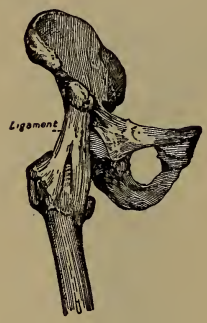


FIG. 13. — A ball-and-socket joint.
At the hips; showing ligament.

HYGIENE OF THE BONY STRUCTURE

Rickets or Rachitis.— When children do not get enough animal food, they develop between the sixth month and the second year a disease called *rickets*. This disease is due to softening of the bones; or rather, the bones *remaining* soft, because there is not enough mineral matter in the food to make them harden. Rickets is shown by bow-legs, knock-knees, enlargement of the bones at the wrist and ankle, curving of the collar-bones, and sometimes by spinal curvature. A physician should always be consulted about such cases, especially if the child cannot walk at the age of one year.

FRAME FOR PATIENT WITH HIP-DISEASE

Tuberculosis or Consumption of the Bones. — This condition is very common. In the spine it is called *Potts' Disease* and causes hunchback, with sharp curves and abscesses. It may be seen in any bone or joint of the body, especially on the hip (where it is known as hip disease), knee, ankle, and elbow. Children coming in contact with a consumptive person generally contract the disease in the bones and not in the lungs. It is also contracted by children who drink the milk of tuberculous cows.

The treatment of these cases consists in fresh air, good food and rest. Children do especially well in the salt air at the sea shore, and there are now many hospitals and sanatoriums where these diseases are treated, notably the Children's Sea Shore House at Atlantic City, N. J., and the Sea Breeze Seaside Hospital, N. Y.

Softness of Young Bones. — In the skull of an infant the bones are not joined completely. Especially on top, near the centre, is a very thin spot covered only by skin. A slight blow here may prove fatal.

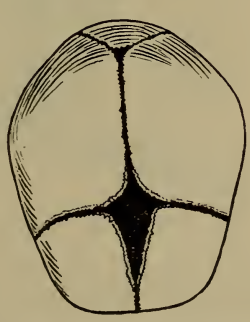


FIG. 14.—The soft spot or fontanel in a baby's skull.

It is natural and best for children to creep and crawl, as it exercises the muscles and eventually leads to walking; but if children are allowed to stand and walk too soon, the leg bones may bend under the weight, causing knock-knees or bow-legs, even though there may be no disease present. Clothing about the waists of children, if worn too

tight, will cause a groove in the lower ribs and prevent proper filling of the lungs with air. Heavy dresses hung on straps from the shoulders will cause shallow grooves in the collar-bones.

Fractures. — A *fracture* is a break in a bone. Children's bones, being weaker and smaller, break more easily than those of adults and, because they are elastic, they break like a tough green stick, splintering and cracking instead of making a clean break. Such a break is called a *green-stick* fracture. The bones of old persons, also, break easily because they lack animal matter and are brittle.

FIG. 15.— Fracture of the humerus.

Broken bones must be *set;* that is, the broken ends brought together and tied to a splint to keep them at rest in position till the ends grow together. A splint is usually made of light wood or plaster. In young adults, the bones will unite in from three to six weeks; in old persons it takes much longer, and sometimes they never unite. If the broken ends of bone protrude through the skin, the break is called a *compound* fracture. *Healing by first intention* means that the bones and skin unite without any trouble; that is, there is no infection of the wound by pus. *Delayed union* takes place in people who are in a poor state of health, in old persons, and in those addicted to alcohol.

Curvatures of the Spine. — The *backward curve* is shown in a slight degree by round shoulders; in a marked degree by a hunch-back. The most serious result is a flat chest and difficult breathing. Curvatures of this sort result from various causes: from occupations requiring habitual bending forward of the body (tailors and dressmakers); from slipping down in the seat when working and reading; from high-heeled shoes, tight corsets or from habitually holding the head forward. The *correct standing position* is chest up, chin in, hips back. The *correct sitting position* is sitting squarely on the seat with the back parallel to the back of the chair and both feet resting firmly on the floor. On rising from a chair, raise the chest first and the rest of the body will follow. Bend forward from the waist line only, keeping the back straight. On sitting down, take the same precaution to keep the chest high, and the back straight.

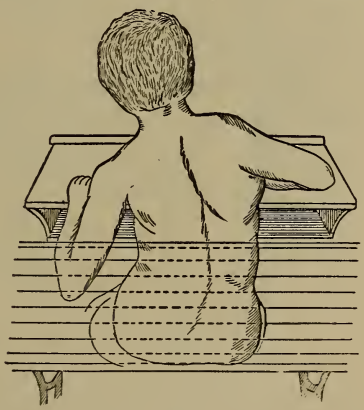


FIG. 16.— Effect on spinal column of improper position in writing. (From Pyle's *Personal Hygiene.*)

Lateral curvature may be due to certain diseases, such as pneumonia and pleurisy. It may also result from a bad standing position with the weight on one foot; from carrying books on one hip or side; from defective eyesight, which causes the head to be carried on one side; from writing at a desk which is too high or too low, etc. The deformity may be corrected by exercising

the neglected muscles, by standing and sitting correctly, and by breathing deeply and holding the chest high. The shoulders will take care of themselves.

The Joints. — A dislocation results when the end of a bone is forced out of its proper place in a joint. The ligaments may be torn or stretched. Usually a physician's aid is necessary to reduce the dislocation. Sometimes, however, a strong pull on a limb will be sufficient.

Strains and Sprains. — When the ligaments are only stretched, a *strain* results; if they are torn and the joint damaged, a *sprain* is the result. For a sprain, tie up the part in a towel full of crushed ice, or immerse the part in hot water. If only a strain, give the part gentle massage and support; but in the case of a sprain rest should precede massage.

Rheumatism. — Rheumatism is a blood disease, which sometimes shows itself by pain, swelling, and stiffness in the joints. The parts should be rested, and a doctor consulted as to treatment.

IV.— THE EXCRETORY SYSTEM.

PHYSIOLOGY OF THE EXCRETORY SYSTEM

The excretory system consists of the *kidneys*, the *bladder*, and the *skin*.

All of these organs act as scavengers, i. e., they rid the body of poisonous materials which otherwise would do much harm. They must always be in good working order for the body to be healthy. Any interference with the excretion of urine or perspiration causes severe illness and sometimes death.

The skin and kidneys work together. In summer, when the skin is very active, less urine is passed. In winter, the skin is less active and more urine is passed.

The lungs aid in excretion by disposing of moisture and poisonous animal matter.

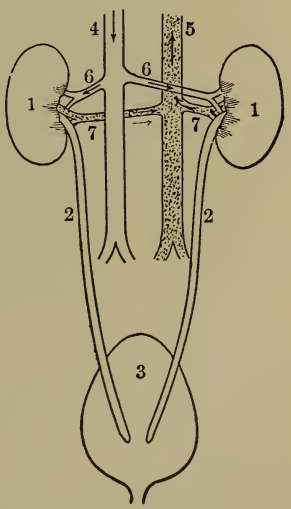


FIG. 17.— Relations of the kidneys. (Back view.) 1, the kidneys; 2, ureters; 3, bladder; 4, aorta. 5, inferior vena cava; 6, rena arteries; 7, renal veins.

The Kidneys. — The kidneys, two in number, are situated on either side of the spinal column, just above the waist line. They are bean-shaped, about four inches long, two inches wide, and one inch thick. They are a dark

brown color in health, and are attached to the back of the abdominal wall. Each kidney is supplied with an artery and a vein, nerves and lymphatics. The mass of the kidney is composed of tubules which excrete the urine. They contain the urine as it is segregated, and finally unite to form a funnel-shaped cavity on the inner edge of the kidney. From this cavity a tube called the *ureter* carries the urine to the bladder, where it is stored. There are two ureters and one bladder.

The Bladder. — The bladder is a round organ, situated low down in the front of the pelvis. The urine from the two ureters is collected in the bladder, which when full is emptied through a tube called the urethra. The bladder should be emptied about four or five times daily. The urine contains mainly a poisonous material called urea. If this is retained in the body it causes headaches, rheumatism, and other troubles.

Children who unconsciously "wet the bed," should never be punished, but should be taken to a physician and treated for a trouble over which they have no control.

The Skin. — There are two layers — an outer, firm layer, called the *epidermis*, and a thinner, transparent, and more elastic layer, called the *dermis*, or true skin.

The epidermis is composed of a mass of closely packed *epithelial* cells. Those deeper down are round, but as they grow nearer the surface they become flattened. As they grow and subdivide, the cells on the surface die and are rubbed off as white scales which, becoming dirty look like little dark rolls.

The lowest layer of cells in the epidermis contains the

coloring matter, called *pigment*. This pigment absorbs and arrests light. People living in hot climates require more pigment in their skins to withstand the direct rays of the sun, hence the dark skins of the natives of tropical countries and the fair skins of those in colder lands. Sun-

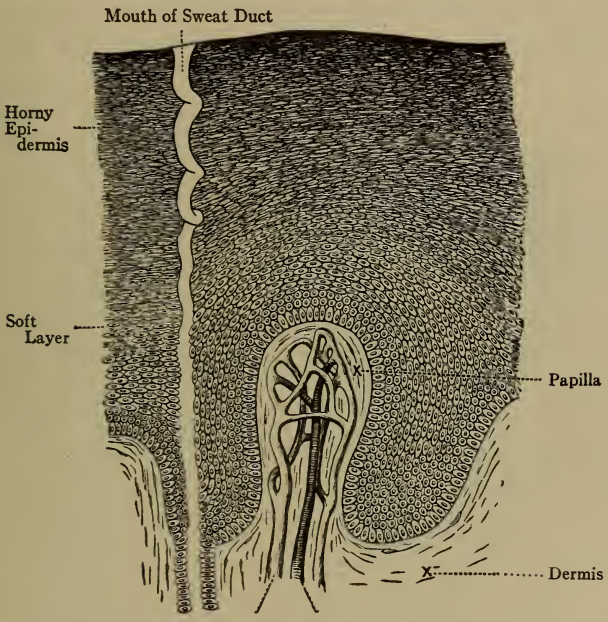


FIG. 18.— Section of epidermis, showing papilla. (Highly magnified.)

burn is simply Nature's method of protecting the underlying tissues.

The dermis or true skin is connective tissue containing sweat and oil glands, roots of hairs, blood vessels, nerves and lymphatics. It is connected with underlying organs by a loose layer of tissue in which fat may be stored. The upper layer of the dermis rises into a number of pro-

jections called *papillæ* or papillas, with which we feel. The epidermis fits over the papillas and fills the hollows between them, except on the palms of the hands and the soles of the feet. Each papilla contains a blood vessel and a nerve. The papillas on the finger tips grow in irregular rows or lines, all showing different patterns. In some of the larger cities, ink records are made of the thumb prints of criminals as a means of identification, no two persons ever having the same markings.

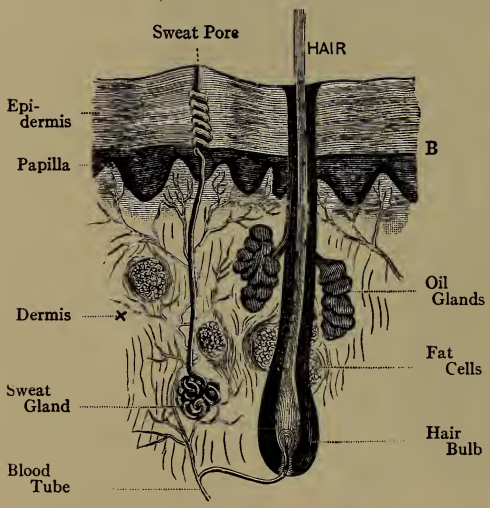


FIG. 19.—Vertical section of the skin.

Hair is an outgrowth of the skin. Each hair grows from a follicle in the true skin. A blood vessel and a nerve go to the root or bulb from which the hair grows. Hair is found all over the body, except the palms of the hands and the soles of the feet. This fact helps to classify us as mammals.

Each hair is surrounded by little *oil glands* which keep the hair glossy and the skin soft and flexible.

The *sweat glands* have their origin in the true skin. Each gland is coiled into a little ball, from which a long tube passes through the skin to the exterior, where its open-

ing is called a pore. *Perspiration* is largely water, but it contains a solid substance, urea, which is found also in the urine. The body is perspiring all the time; perspiration usually evaporates on reaching the surface, leaving the excretory material on the skin. The amount of perspiration is regulated in two ways; first, by the amount of blood sent to the skin; second, by the activity of the glands themselves.

The *nails* are horny plates on the ends of the fingers and toes. They are part of the epidermis, but the root grows from a fold of the true skin. The nail grows from its under side, therefore the end of the nail is thicker than the root.

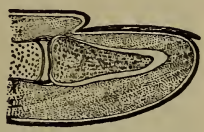


FIG. 20.— Section of end of finger showing nail in position.

Automatic Preservation of Temperature. — If the body is overheated from exercise, a nerve impulse from the brain causes the sweat glands to become more active. The evaporation of the sweat cools the body. Exercise also causes more blood to flow to the skin, and necessitates deeper breathing. The warm blood, coming to the skin, loses its heat to the cool air in contact with the skin; the cool air drawn into the lungs in turn becomes warm — and thus the body is cooled.

HYGIENE OF THE EXCRETORY SYSTEM

The Skin. — A *healthy skin* is as essential to health as soundness in any other organ. Rosy cheeks do not necessarily indicate health as the hectic flush on the cheek of the consumptive proves; but there should be a rosy flushing through the skin, with a bright pink color in the lips,

the gums, the mucous membrane lining the eyelids (called the *conjunctiva*), and the ears. Paleness often means a poor circulation, liability to colds, indigestion, etc. *Weak skins* are caused by lack of exercise, which allows the sweat glands to become clogged; by wearing too heavy clothing or by not changing the clothing often enough; and by liv-

A GROUP OF NEGROES IN THE TROPICS

ing in overheated rooms. Cold air and cold water are the best means of strengthening a weak skin. A healthy skin is so accustomed to cold that it is not afraid of draughts of air at any time, except when it is wet with perspiration. A cold bath is to the skin what exercise is to the muscles.

Difference in *complexion* is due to the amount of pigment in the skin; the brunette has a great deal, the blonde very little, while the albino has none at all. In hot countries the

dark pigment in the skins of natives absorbs the light and heat rays and protects the parts beneath. Sunburn and tanning are only Nature's method of protecting the organs of those persons not normally equipped with sufficient pigment in the skin. Paint and powder injure the skin by clogging the pores and preventing the flow of perspiration.

A good complexion is obtained by frequent bathing and washing the face with good soap and soft water, by eating nutritious food and but little candy — for many blemishes on the face are caused by indigestion — by taking a fair amount of exercise and plenty of sleep; and, above all, by cultivating a happy disposition, for unhappy thoughts are shown in the expression of the face. Beauty is of three kinds, and anyone may possess at least one of the three: beauty of feature, of color, and best of all, of countenance, the result of culture of the intellect emotions, and morals.

FIG. 21.— Section of negro skin showing the great number of pigment cells.

Superfluous hair can be removed by the electric needle only. Quack medicines only remove it temporarily, overstimulating the follicles so that the growth returns quicker than before.

Blackheads are enlarged pores filled with dirt and oil.

They can be removed by steaming the face, applying cloths wrung out in hot water — and then using massage.

Pimples are small swellings due to the clogging and subsequent inflammation of the pores or the oil glands.

Freckles are small patches of brown pigment caused by exposure to the sun.

A *scar* is a mark left by a wound which the epidermis has failed to cover, white fibrous tissue taking its place.

A *mole* is a pigmented raised spot, often present from birth; containing blood vessels and sometimes hairs. All moles should be left entirely alone and no attempt whatever made to eradicate them. It is best to have them removed by a surgeon, as they sometimes degenerate into cancerous tissue

A *wart* is a rough elevation of the skin caused by several papillæ in the dermis pushing out at a weak spot. The real cause of warts is not known. They are, however, not caused by handling toads, and they can be removed only by the application of some caustic. Usually either fuming nitric acid or silver caustic is used, but these remedies should be applied by a physician only, as severe burns have resulted from their use by unskilled persons.

A *corn* is a thickening of the epidermis caused by pressure or friction. At the earliest intimation of trouble from a corn, bunion, or callus, procure a good make of surgeon's plaster, or adhesive plaster, and use enough to cover the part. This is not only preventive, but curative, and will give great relief. It is dangerous to pare a corn or callus with a knife or a razor. The knife should be surgically clean; that is, *boiled* for five minutes, or thoroughly washed in an antiseptic solution. Blood

poisoning from using a dirty knife to cut corns is a common occurrence, and a serious matter. If special treatment seems necessary, consult a chiropodist.

For *tender* or *tired* feet, apply witch hazel or bathe in hot water and then cold, using a tablespoonful of alum, borax, or salt to a basin of water. Then rub briskly with alcohol. The feet, as well as the neck and all creases of the body, should be bathed every day.

FIG. 22.— Normal foot contrasted with one deformed by cramping.

Baths and Bathing. — Baths may be taken to promote cleanliness; as a tonic and stimulant to the skin; and as medicinal agents. John Wesley, in a sermon on "Dress," said, "Cleanliness is next to godliness." In other words, a moral elevation accompanies bodily purity and cleanliness. Purity of the morals and purity of the mind are found with a clean body. Cleanliness promotes personal neatness, without which there is a lack of proper self-respect and a positive disrespect for the feelings of others. All nations, as they advance in civilization and refinement of manners, pay more attention to personal cleanliness. This is shown at the present time in the number of bath-rooms, bath-tubs and various devices for clean-

A MODERN BATH-ROOM

liness which are looked upon as necessities, not as luxuries, in our houses.

The ancient Greeks and Romans paid a great deal of attention to their baths, having great public baths which they used every day. These baths consisted, first, in an exposure of the body to hot air, followed by a dry rub; then hot water, followed first by tepid and then by cold water; then a scraping of the skin with bronze instruments; and last of all an anointing of the body with precious perfumes.

The *Turkish* and *Russian* baths of to-day are modeled on these old Greek and Roman baths, the Turkish bath employing hot air, while the Russian uses steam, followed by a kneading of the body and a cold plunge. These baths are very stimulating and invigorating to a strong, healthy person, but should be avoided in cases of heart disease, advanced lung disease, great debility, or acute inflammations.

Baths are classified according to *temperature* into:

Hot: 98° Fahr. and upward,
Warm: 90° Fahr.,
Tepid: 80° Fahr.,
Cold: 70° Fahr. and downward.

Baths are classified according to *kind* into:

Shower or spray; sponge; and tub.

The hot bath may be taken for medicinal purposes:—

1. To relieve congestion causing pain or inflammation in internal organs. In such cases the hot bath draws the blood to the surface.
2. To alleviate fatigue and exhaustion.
3. To stimulate the body in cases of shock.

Results of the Hot Bath:

1. The temperature of the body is raised.

2. Blood vessels in the skin are dilated and the skin becomes reddened.

3. Internal congestion is relieved.

Precautions:

1. Do not expose the skin to cold air after a hot bath; go to bed and keep warm.

2. If for any reason it is necessary to go out after a hot bath, take a cold shower and a brisk rub to tone up the relaxed skin.

3. Do not take a hot bath just before or after a meal.

The Warm Bath.—In this bath the body loses exactly as much heat as it does normally in the air. The warm bath has no decided effect on body temperature. It is mainly cleansing, to dissolve the excess of perspiration, oil, and dust. It should be a tub bath, taken at least twice a week, using plenty of good soap and a brush, and should last ten or fifteen minutes. It should be taken before going to bed. If one must go out after bathing, follow with a cool sponge and rub.

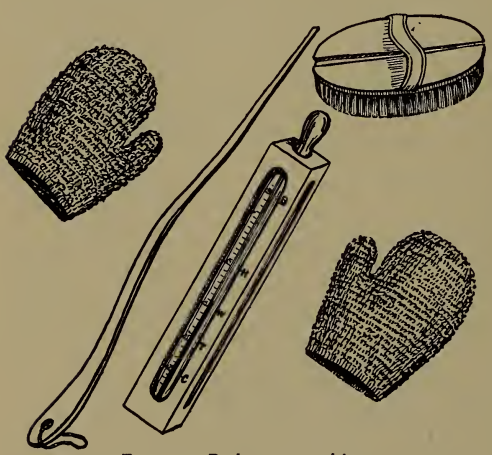


FIG. 23. — Bath-room requisites.

The Cold Bath. — This is stimulating and tonic. It should be taken in the morning on rising, when the skin is warm and relaxed and needs toning up. The cold bath should last from fifteen to sixty seconds and should be followed by a rub with a rough towel. This bath may also be taken after any muscular exertion causing perspiration, such as gymnasium work; or it may be used with benefit after the hot or the warm bath.

Precautions:

1. Never take a cold bath in a cold room or when the skin is cold.
2. Never take a cold bath unless it is followed by a reaction, that is a feeling of warmth and tingling.
3. Never take a cold bath just before or just after a meal; wait an hour or two.

The cold bath is beneficial especially in warm climates, and throughout the summer in temperate climates. It is absolutely necessary for those who wear heavy clothes and live in very warm houses.

The cold bath should be a sponge, shower or spray — not a tub bath. Those who object to bathing the entire body should at least sponge the face, neck, chest, shoulders, and arms with cold water every morning to prevent colds. A very cold bath is quite stimulating, and causes a loss of nervous energy; it is weakening if prolonged more than a few minutes.

Sea Bathing.— This popular sport is very stimulating, because of the salt in the water and the exercise accompanying the bath. In sea bathing, be careful to:

1. Bathe on a sunny day, when the sun beats on the sand.

2. Get wet all over at once. Never walk in slowly, allowing the water to creep up the body.

3. Exercise at once, by swimming or jumping about. Do not be afraid to shout and exercise the lungs at the same time.

PUBLIC BATH FOR MEN AND BOYS

Note the Australian Crawl in Swimmer on Left and Treading Water, in swimmer on Right

4. Leave the water when you are in a glow. Do not wait until the lips become blue and the teeth chatter.

5. Remember that the usual length of time for a bath is from five to ten minutes.

Precautions:

1. Never take a sea-bath just before or just after a meal.

2. Never take a sea-bath at night.

3. Never take a sea-bath when the body is exhausted and perspiring from severe exercise. Reaction does not take place, and there is a congestion of the internal organs, especially the nerve centres in the brain, causing cramp.

4. Never take a sea-bath when the weather is chilly or when a cold wind is blowing. The body becomes cold while undressing and is further chilled in the water. The actual temperature of the water is not so important as the relative difference between the temperature of the air and water. The temperature of the water should be much lower than that of the air.

Bather's Cramp. — This is a painful spasm of one muscle or a group of muscles, particularly of the leg. If it occurs all over the body, the person sinks like a stone. Cramp may be induced by the sudden plunge of an overheated body into cold water; or by prolonged exercise, as continuous swimming; or by any sudden or unusual exercise. It occurs generally in good swimmers and athletes, who become foolhardy. The only remedy is to turn on the back and float while calling for help.

Care of the Ears While Bathing. — Do not allow salt water to enter the ears. It is irritating to the mucous membrane of the ears, nose, mouth and eyes. Put small plugs of cotton in the ears, and take all waves on the back, never on the side or face.

Swimming. — This is one of the finest of exercises, as it calls into use all the muscles of the body. It should, however, not be indulged in more than once a day, and then for a period not exceeding a half hour. The heat produced by the muscular exercise counteracts the effect of the cold water. Every child should be taught to swim.

For Non-swimmers.—In case of emergency, tread water like a dog on all fours, or in swimmers' parlance "paddle doggie." Do not raise the arms out of the water, as you will start to do instinctively, but *keep them low*. Hold the chin up and do not hurry, but paddle quietly till help comes. If possible, float when tired.

The Hair. — All mammals have hair for protection as well as for beauty. On the scalp it protects the brain from blows and from changes in temperature. It protects the eyes from dust and the ears from insects; the beard in men protects the larynx, which is larger and more prominent than in women. In primitive man, who hunted wild beasts, the beard was a protection to the throat. On the body, except in the palms and soles, it gives a larger surface for carrying off perspiration and increases the delicacy of touch. *Goose flesh* is the remains of an old reflex action which causes the mammal to raise the hair on the body to promote warmth.

The *scalp*, to be healthy, should be thick, freely movable and should have good circulation. If the scalp is thin, the blood vessels are few and small; they are drawn too tightly over the skull and circulation is obstructed, thus causing the hair to become thin. To correct this condition the scalp may be loosened by massage. The oil glands around

the hair keep it glossy and waterproof and make the skin soft and flexible.

Dandruff is composed of scales of dead skin and oil. An excess of dandruff is a disease of the scalp. It causes great

AN ENERGETIC USE OF THE HAIR BRUSH

irritation of the scalp and as a consequence, prevents nourishment and makes the hair thin.

The Shampoo.—If the hair is washed too often, the oil is removed and the hair becomes dry and thin. If the hair

is not washed often enough, it becomes oily and dirty, dandruff develops, and the hair becomes thin. Hair should ordinarily be washed once a month; oily hair, every two or three weeks; dry hair, every six weeks. A good soap should be used, and the hair rinsed and dried thoroughly. If possible, dry in the sun, out of doors. A dry shampoo, instead of washing, is excellent between weeks. Brushing, massage, the application of a good hair tonic, and sometimes the electric vibratory machine, will do much to stimulate the circulation of the blood in the scalp.

Baldness.—This is due especially in men, to a tight, warm covering on the head. Men's hats are harmful, in this respect, being often of felt, with tight hatbands causing a red line around the forehead. Cool air and sunlight are stimulating to the hair; it is therefore beneficial to go bare headed in summer when the sun is not too hot.

To care for the hair, brush daily, clean the brush on a towel and wash it in ammonia water once a week. In buying a comb, see that the edges of the teeth are smooth so that they will not catch the hair. The material of the comb may be bone or ivory—never metal. The brush should not be too soft nor too hard. Metal brushes wound the scalp. Avoid electric and wire brushes.

Avoid the use of *hair-dyes* or *restorers*. They contain poisonous substances, which may cause serious injury. Avoid hair "rats" and artificial hair puffs. They are almost always unclean and they make the head hot and damp, thus thinning the hair.

Avoid *curling-irons*, as they ruin the hair by breaking and singeing it, the hair becoming ultimately dry and thin.

The condition of the hair, also of the nails and the skin itself is a reflection of the general health. *Gray hair* may come suddenly from fright, joy or grief, though such cases are much more rare than we are commonly led to believe. The pigment in the shaft of the hair is replaced by bubbles

GIRLS DRYING HAIR AFTER A SHAMPOO
Note the natural head of hair of girl on right, and hair ruined by tonics and curling-irons of girl on left.

of air, though the hair may still be healthy. Graying of the hair from age is usually due to lack of nutrition from natural causes, as well as from overwork, anxiety, and in case of black hair, to hereditary tendencies. Gray or white hair, if tastefully arranged, is a crown of beauty for the mature or elderly woman.

To Improve Thin Hair.—The scalp circulation may be improved by general tonics taken internally, and by massage. The best local hair tonics are sunshine, cleanliness, and massage. There are many "patent" hair tonics on the market, some of which are good, some bad, but all expensive. Do not waste time and money on such preparations, but consult a good skin specialist to ascertain whether a medicinal hair tonic is really needed. He will prescribe a beneficial tonic that may be used without injury to the hair or skin.

Pediculosis or Lice in the Hair.—The louse is a parasitic insect, living on the human scalp. It lays its eggs, called *nits*, on the hairs in little white gummy cases. Lice reproduce very quickly and are easily carried from one person to another. Anyone may at some time in his life become afflicted either with lice in the head or on the body. In case of such a misfortune no stigma need attach to the person, the infection being accidental. To get rid of lice observe the following:

Wash or shampoo the hair with soap and warm water. Apply tincture of fishberry or tincture of larkspur to the scalp for three nights in succession, tying up the head in a towel. Then shampoo the head again and apply the remedy for three more nights. Use a fine comb every day. For the nits, wash in a solution of vinegar and water. Kerosene may be used and is efficacious, but there is always the danger of catching fire.

The Nails. — The nails are a protection for the fingers and toes. They enable us to grasp objects more firmly and they help us to pick up small objects. They should be long enough to cover the finger.

Transverse grooves across the nails are caused by illness, during which the growth is stopped. The new cells are at the root; therefore if the root is destroyed the nail will not grow again. A finger-nail requires from four to six months to grow; a toe-nail, six to twelve months; a great

CARE OF THE NAILS

toe-nail, twelve or twenty months. To care for the nails observe the following :

(1.) Soften the nails, first, in warm, soapy water.

(2.) Cut the edges carefully with strong, curved scissors and trim the ragged corners with a nail file.

(3.) Never touch the upper flat surface with a sharp instrument.

(4.) Gently push the skin back from the nail with an orange-wood stick, to prevent hangnails. A hangnail is a small piece of skin, due to a break caused by the skin's adhering to the nail as it grows. They are very ugly and painful and may be a source of infection.

(5.) Brush the nails with a brush, soap, and water to get the dirt and germs out from under the nail. A pointed stick rubbed with soap may also be useful.

(6.) Do not bite the nails, as it stubs the fingers, giving them an ugly shape, and impairs the sense of touch. It is a nervous habit which may be broken by applying to the nails a solution of bitter quinine. Small pieces of nail if swallowed, as is likely, will tend to injure the linings of the digestive tube. Biting the nails is, moreover, a most unseemly habit.

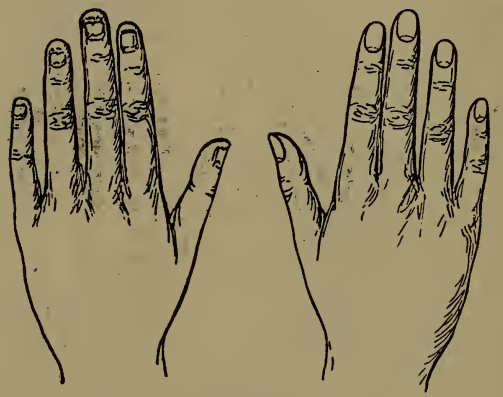


FIG. 24.—Perfect, and bitten nails.

CLOTHING

Man is the only animal that wears clothing. This is the reason why man is the most widely distributed of all the animal species for, by the addition of clothing, he may

change his habitation from warm to cold climates and *vice versa.*

Uses of Clothing. — The chief use of clothing is to retain the body heat. It also protects the body from injuries, from extremes of heat and cold, and from sunlight. People should take pride in keeping their clothes clean and neat. Those who do so are much less liable to infectious diseases.

Materials. — Clothing may be made of wool, silk, cotton, linen, leather or fur. The effect of clothing depends on the weave. *Woolen* is woven loosely and has large air spaces in the meshes; it is therefore *warm.* It absorbs moisture readily, but dries very slowly. It also absorbs odors. *Silk*, *cotton*, and *linen* are all woven tightly. The threads are close together, leaving only small air spaces. These materials are therefore *cool.* Linen is coolest, because it is woven very hard with the smallest meshes. Cotton and linen absorb moisture rapidly and also dry rapidly.

Underclothes. — Woolen underclothes are very warm; they absorb perspiration readily, but dry very slowly, thus chilling the body. Cotton and linen underclothes are cooler than woolen. They also absorb perspiration, but they dry quickly: therefore they make the best underwear. When cotton and linen are woven like stockings they are much warmer than when woven as dress goods. The weaving and the quality of drying quickly are more important than the materials. Cotton underclothes are cheaper than woolen and do not shrink in the washing nor harbor moths. A judicious mixture of wool and cotton, or silk and cotton, is good. Woolen underclothes may be worn by delicate little children and old people.

Underclothes should be changed frequently; at least once a week in winter and twice a week in summer. All clothing worn during the day should be removed at night and carefully aired. In the morning the bedclothes should be pulled from the bed separately and spread on chairs before the open window. Bedclothing should be light and warm. Weight is not warmth, as may be seen in the case of a down quilt which is very light but very warm.

Outer Clothes. — In winter, the outer clothing should be of wool; in summer, of linen, cotton, or silk. In winter, too heavy clothing should not be worn in the house, as it causes overheating; neither should the house be so warm as to necessitate very thin clothing. Dressing too warmly drains the body of nervous energy. A heavy coat should be put on when going out in cold weather.

Rubber, leather, and fur are warm, because they are impervious. In these materials there is no ventilation, and consequently no evaporation of the perspiration.

In spring and fall, the clothes should be changed according to the *weather*, not according to a certain date on the calendar.

In summer, clothes should be thin and loose, and preferably of linen and cotton. Protection from heat depends somewhat on the color of the clothing. Black and white are not, strictly speaking, colors as black is absence of color, while white is a union of all colors. However, custom sanctions the use of the word color in referring to black and white. The coolest color is white, because it reflects heat. Following in order of coolness are gray, yellow, light

blue, pink, the darker colors, and black. Black is the warmest color, because it absorbs heat.

The large blood vessels are nearest the surface at the neck, wrists, knees, and ankles. Therefore, very thin or no covering on these parts tends to keep the body cool. High collars, high shoes, and long sleeves should be worn in winter

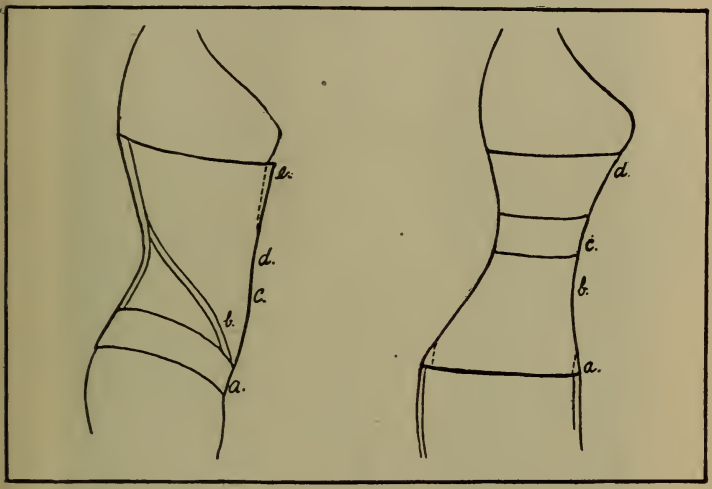
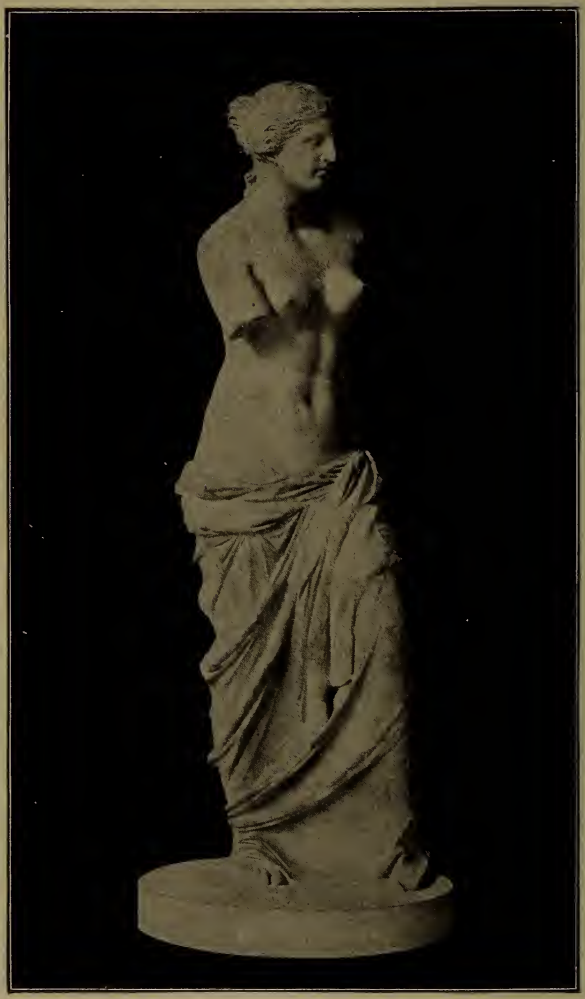


FIG. 25.—Models of hygienic and unhygienic corsets. (*a*), point at which corset may be snugly laced without harm. (*b*), (*c*) and (*d*), points at which tightening is harmful. Compare the figures.

and discarded in summer. Women are usually too cold in winter, while men are too warm in summer. Each might take a lesson from the other.

Wet clothes conduct heat *from* the body, and a chill follows. On rainy or snowy days, thick, high shoes and rubbers should be worn, but one should be careful to discard the rubbers while indoors. Damp clothes are favorable to skin diseases.



VENUS DE MILO

Tight clothes cramp the necessary movements of the body and interfere with circulation and ventilation. Shoes, stockings and garters worn too tight cause cold feet by interfering with circulation. Tight collars cause headache and dizziness, as well as an ugly, thin neck. Every girl wants a pretty neck, and the way to have one is not to wear a collar at all. Tight corsets and belts indicate either ignorance, stupidity, or carelessness. The girl who contracts the waist by a corset or belt shows ignorance of the structure of the body, the laws of health, the laws of art and beauty, and an utter indifference to her own strength and well being.

FIG. 26.—(*a*) Outline of shoe. (*b*) Outline of foot. (*c*) Outline of weight-bearing area of foot.

Tight corsets interfere with breathing and the heart action, and displace downward the stomach, liver, and intestines. Fainting is not uncommon in girls wearing tight corsets. By compression of the lower lungs, these parts remain flat and unused, and liable to attack by the tubercle bacillus, or germ of consumption. It is therefore especially dangerous for a girl having in her family history a tendency to consumption or tuberculosis to wear a tight corset. There are a number of corset waists on the market which may be worn if some support is needed for the waistband of the skirts. At the present time, it is a beneficent fact that large waists are the height of fashion. One-piece gowns also do away with the tight

belt and skirt band, besides being a becoming style for most people.

Dyes. — Dyes in clothing should be absolutely fast. Shirts, stockings, and flannels should be watched in this particular, as skin diseases and blood-poisoning have been known to arise from dyes.

Shoes. — Shoes should be three-quarters of an inch longer than the foot. They should have broad toes, heels not more

FIG. 27.— An X-ray view of the human foot in a hygienic low-heeled shoe. (Note that none of the bones are cramped.)

than one inch high, and a straight inner side. High heels throw the body forward. A person wearing high heels tires easily and becomes irritable; the eyes become strained; round shoulders develop, with a flattening of the chest and shallow breathing; sometimes curvature of the spine follows. There is an ugly, ungraceful, stilted walk, with a contraction or shortening of the tendon Achilles in the back of the heel, so that low-heeled shoes finally become uncomfortable.

Tight, narrow, pointed toes cause corns, bunions, and

calluses, and develop on the feet a valgus or turning out of the great toe. Tight stockings will also cause this condition. Stockings should be rights and lefts like the shoes, and should be wide enough to accommodate the feet comfortably. Heavy bedclothes sometimes distort the feet.

Rubber heels save the spine a great deal of shock in walking. Rubbers protect shoes in wet weather. Shoe trees should be used to keep the shoes in proper shape.

FIG. 28.— High heels. An X-ray view of foot in unhygienic high-heeled shoe. Note injurious effect on bones of foot.

It is better to have several pairs of shoes in use at one time, than to wear one pair constantly until worn out.

Black shoes are warmer than brown ones. Patent leather shoes are bad because they are poorly ventilated.

Flat foot results from a breaking down of the arch of the foot. It should be treated by an adequate support in the shoe and by exercises to strengthen the muscles and tendons prescribed by an orthopedic surgeon. This condition is very common, though often unrecognized.

SUITABLE AND UNSUITABLE SHOES FOR OUTDOOR USE.

For soft corns powder with baking soda or alum and put a piece of lamb's wool or soft linen between the toes. At the earliest indication of trouble, place a piece of adhesive plaster over the sore spot to prevent friction. Large corns should be treated by a chiropodist.

Varicose veins, *chilblains* and frost-bite result from defective circulation, and should be treated by a physician.

FIG. 29.—Bones of foot in round toed and pointed shoes.

FIG. 30.—Flat Foot.

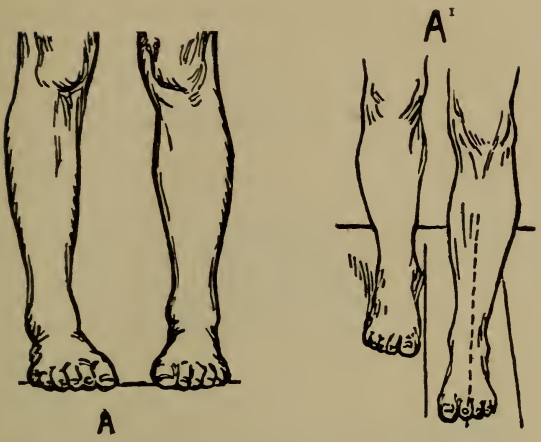


FIG. 31.— Proper position of feet in standing (A) and walking (A^1). Note the "toe ing in" and grasping position of the toes.

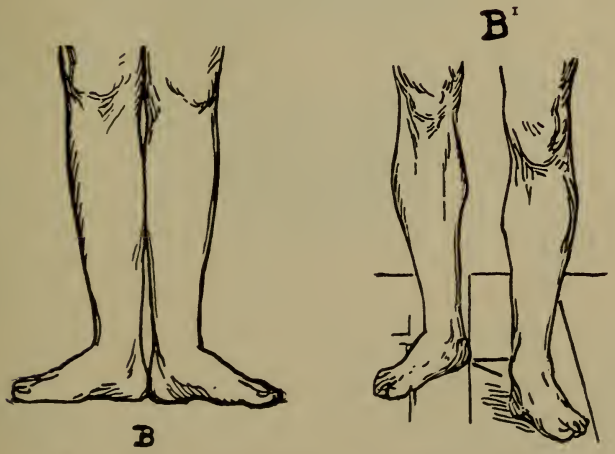


FIG. 32.—Improper position of feet in standing (B) and walking (B^1).

V.— THE DIGESTIVE SYSTEM.

PHYSIOLOGY OF THE DIGESTIVE SYSTEM

The Digestive System consists of the *alimentary canal* and the *glands* which assist digestion. The alimentary canal or tube is divided into the *mouth*, *pharynx* or *throat*, *œsophagus*, *stomach*, *small* and *large intestine*. It is lined throughout with a mucous membrane. The large glands assisting in digestion are the *salivary glands* in the mouth, the *liver*, and the *pancreas*.

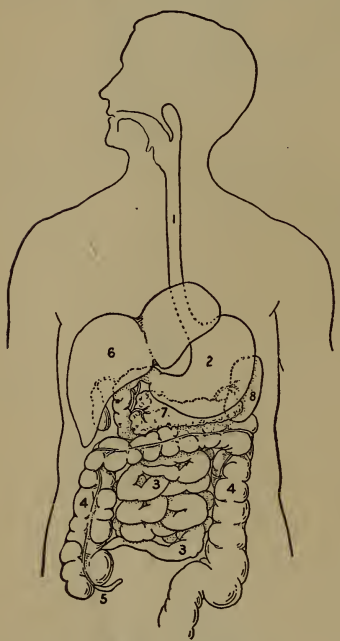


FIG. 33. — The digestive system. 1, the gullet; 2, stomach; 3, small intestine; 4, large intestine; 5, appendix; 6, liver; 7, pancreas; 8, spleen. The liver is here represented as raised somewhat so as to show the organs behind it.

The Mouth.—The important structures in the mouth are the *tongue*, *teeth*, and *salivary glands*.

The Tongue.—The tongue is composed of muscles, covered with mucous membrane, and is used in masticating the food, in speaking, and in tasting.

The Teeth.—There are two sets of teeth, the *milk* and

the *permanent*. The milk teeth are twenty in number. They appear between the fourth and eighth month, the two middle lower incisors appearing first. The set should be complete by the second year.

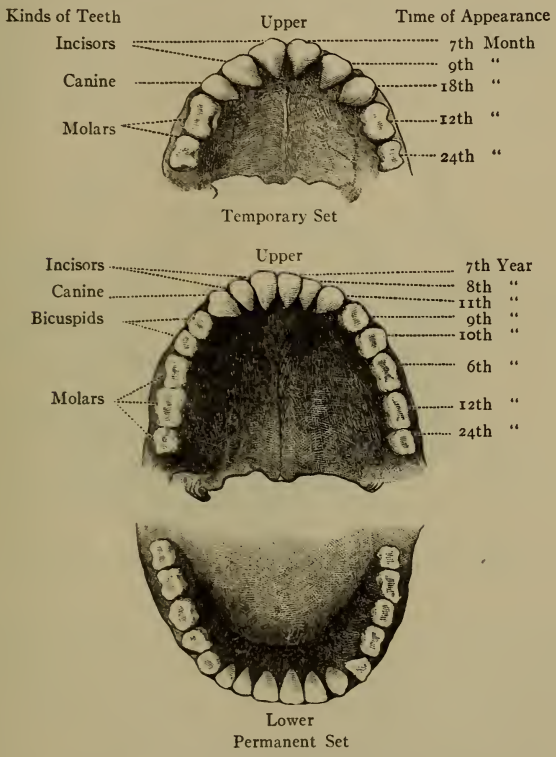


FIG. 34.— Teeth: kinds, arrangement, and time of appearance.

The permanent teeth are thirty-two in number, eight in each half of each jaw. The two front ones in each half jaw are called the incisors, from their chisel shape. They

are for cutting the food, and correspond to the teeth of rodents. The next tooth in order is the canine, or eye tooth, which is used in tearing the food, and corresponds to the long teeth of flesh-eating mammals. The next in order are the two bicuspids, and three tricuspids or molars, used in grinding food; these correspond to the teeth of grain-eating mammals. The last of the three molars is called the wisdom tooth, as it does not appear until the

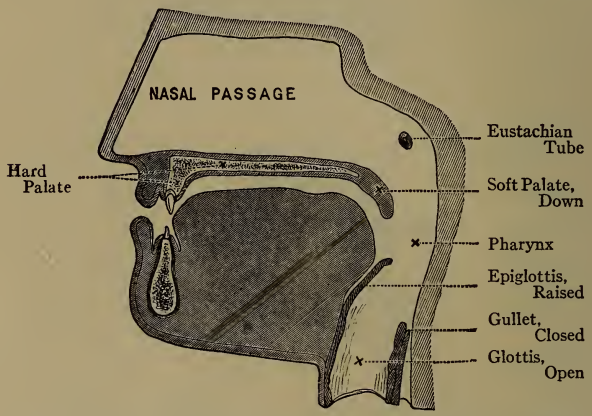


FIG 35.— Positions of the organs of the mouth and throat during breathing.

eighteenth or twentieth year, supposedly the age of wisdom. In reality it is a shallow root, useless and troublesome and lasting but a short time. It is one of the proofs of the evolution of man from the lower mammals.

The parts of a tooth are the *crown*, *neck* and *root*. The crown is the part which is visible. The root is the part which is sunk in the jawbone. The neck lies between crown and root and is at the edge of the gum.

A tooth is composed of *enamel*, *dentine*, *cement*, and *pulp*.

The enamel is the hard, white, glistening substance on the outside of the crown. Dentine gives hardness to the tooth. The cement is a layer that holds the root in the jawbone. The pulp is a soft, reddish material on the inside of the tooth and consists of blood vessels, nerves and some fat. The pulp is the part of the tooth afflicted when one has a "toothache," because of the nerves.

There are three pairs of salivary glands in the mouth

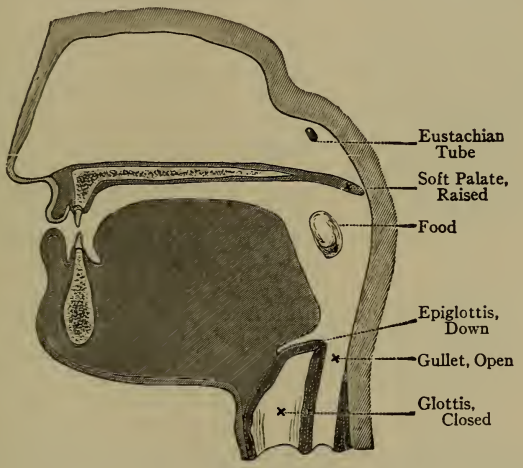


FIG. 36.— Positions of the organs of the mouth and throat during swallowing.

which pour out their secretion to be mixed with the food. They are the *parotid*, the *submaxillary* and the *sublingual*. The secretion of these glands, plus the secretion of mucus from the mucous membrane lining the mouth, forms a digestive juice called saliva, which acts on starches, changing them into sugar.

Inflammation of the parotid gland is called "mumps," or parotitis, the suffix "itis" meaning inflammation.

Pharynx and Œsophagus. — The back of the mouth, commonly known as the throat, is called the pharynx. The nasal passages open into the upper part of the pharynx, as do also the two Eustachian tubes from the middle ear. The soft palate hangs down into the pharynx from the roof of the mouth. At the root of the tongue, on either side, are two soft, reddish-brown bodies, called the tonsils. There is a third, smaller tonsil at the base of the tongue. At the back of the pharynx are the openings into the larynx and œsophagus. The larynx lies in front, and all food swallowed must pass across it. Therefore it is protected by a lid, called the epiglottis, which prevents the food from slipping down into the wind-pipe.

There are *seven* openings into the throat; i. e., two from the nasal passages, two from the Eustachian tubes, one from the larynx, one from the œsophagus and one from the mouth cavity.

The œsophagus or gullet carries food from the mouth to the stomach. The walls are muscular and by their contraction the food is passed along.

The Stomach. — The stomach is an enlargement of the alimentary canal, which holds about two quarts. It lies on the left side, under the ribs and below the heart. In the walls are several layers of involuntary muscles, the function of which is to keep the food in motion while digestion is going on. In the mucous membrane lining of the stomach are glands which secrete the gastric juice. This juice is acid and acts on some of the foods — the proteids (meats, white of egg, casein of cheese, gluten of wheat, legumen of pease and beans), changing them into pep-

tones. These are substances readily absorbed by the blood vessels.

The Small Intestine. — This is about 25 feet long and is divided into three parts: the *duodenum*, containing the opening of the ducts from the gall-bladder and pancreas, a wonderful gland that secretes juices for digesting every kind of food, the *jejunum* or the longest portion, and the *ileum*. The walls of the intestine contain involuntary muscles for moving the food along. In the lining of the mucous membrane are thousands of little projections, called *villi*, or villuses, which absorb the digested food. In the walls are glands which secrete the intestinal juice, the action of which is not well known. The small intestine leads by a valve into the large intestine. In typhoid fever ulcers form in the small intestine.

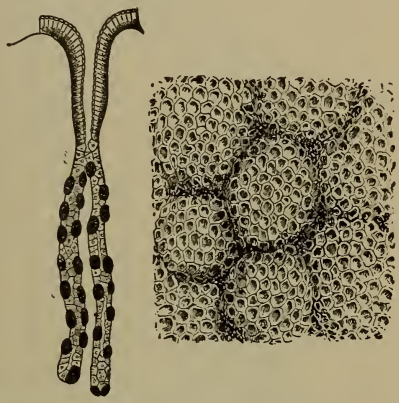


FIG. 37.— Gastric glands. *a*, single gland showing the two kinds of secreting cells and the duct where the glands open on to the surface. *b*, inner surface of stomach magnified. The small pits are the openings from the glands.

The Large Intestine.— This consists of the *caecum*, *colon*, and *rectum*.

The caecum is a large, blind sac into which the small intestine empties itself. From its lower part hangs the *vermiform appendix*. The appendix is from three to six

inches long. Since the caliber is very small, this sac may easily become blocked with food. The circulation in it is poor; therefore it is easily inflamed and the condition known as appendicitis develops. The appendix is all that remains of a part of the intestine used in the lower animals. It is of no use to man, and frequently becomes diseased (appendicitis) in which event it must be removed to prevent a general inflammation of the abdominal cavity. Severe abdominal pain low down on the right side, especially in boys, should never be neglected, but always receive immediate attention. The operation for excision is a simple one if taken in time.

The colon is divided into the ascending, transverse, and descending colon.

The rectum is the last eight or nine inches of the colon, and is provided at the surface of the body with a circular muscle which controls the outlet, known as the anus. Constipation sometimes causes the mucous lining of the rectum to be pushed down outside the anus, causing piles or hemorrhoids. This condition may be treated by the use of an astringent lotion such as witch hazel, or a solution of alum or boracic acid, one teaspoonful to a pint of hot water. In severe cases, always consult a physician.

The Two Large Glands.—The liver is a large, brownish-red organ lying on the right side, under the ribs and below the diaphragm. The cells of the liver manufacture from the blood a liquid called *bile*, which assists in digestion. It is stored in the *gall-bladder* until needed, when it is emptied into the duodenum. The liver also receives partially digested food from the intestines. This material is stored

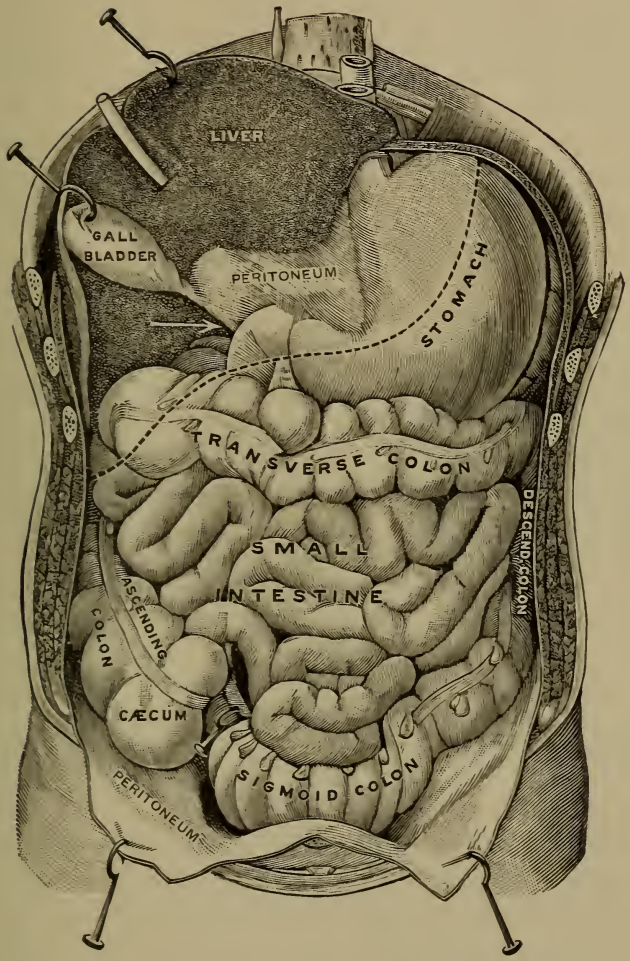


FIG. 38.— Abdominal cavity with organs of digestion in position.

up in the form of glycogen, a food-product somewhat resembling sugar

The pancreas is a pinkish-white organ, lying behind the stomach. Its cells secrete the *pancreatic juice*, which is emptied into the duodenum.

Digestion. — Digestion is that process by which food is changed into substances which will dissolve and pass through the walls of the alimentary canal into the blood.

FIG. 39. —Liver cells where is stored the glycogen; *c*, capillaries.

Digestion begins in the mouth. Here the food is chewed by the teeth, rolled about by the tongue, and mixed with the saliva, about a pint of which is secreted daily. The saliva contains an important ferment, which acts on the starches, changing them into sugar.

A free flow of saliva and the odor and taste of food combine to cause an outpouring of gastric juice in the stomach. When the food reaches the stomach, the pepsin in the gastric juice changes the proteids into peptones, which are easily taken up by the blood vessels in the walls of the stomach. The stomach has several muscular coats, which are used in churning the food and mixing it with the gastric juice so that when the food is ready to leave the stomach by way of the pylorus, or opening into the small intestine, it is in a thick, milky condition.

The food passes from the stomach into the intestine in

small amounts every few minutes, to be acted on by the intestinal juice. This juice splits up proteids, changes common sugar to grape sugar, and stimulates the flow of the pancreatic juice. The *bile* is a greenish-yellow liquid secreted by the liver which helps to emulsify fats and stimulates the action of some of the other intestinal juices. An emulsion is a liquid in which fat is suspended in an extremely fine state of subdivision. There are natural emulsions, such as milk, and artificial ones, such as cod liver oil, mayonnaise dressing, etc.

The Pancreatic Juice.—The more we know of this juice the more important we find its action. It changes proteids into peptones, starches into sugar, besides acting on the fats. The dark mass of food material, consisting of peptones, sugar and soap, is then passed along the small intestine.

Peristalsis.— The contraction of the walls of the intestines causes a wave-like movement, or peristalsis, which propels the food along and mixes it with the intestinal juices. The food is in the intestine from five to fifteen hours, when most of the nourishing part is absorbed. The remainder then passes into the large intestine, where a small amount of absorption occurs; and then the refuse is ejected from the lower part or rectum.

Absorption.— In the small intestine most of the food is absorbed by the villuses, of which there are about twenty thousand to the square inch. Each villus contains a small vessel, called a *lacteal*. The lacteals unite into larger tubes, and finally converge to form the *thoracic duct*. This is a tube lying against the spinal column, which

empties into a large vein in the neck, thus reaching the blood. The peptones and sugars are absorbed directly by the blood vessels of the intestinal wall and finally emptied into the *portal vein*, which also receives peptones from the blood vessels in the walls of the stomach. This blood is carried to the liver where part of the sugar is changed into a substance called glycogen, an animal starch. The liver stores up most of this substance until the body needs it. Some of it is carried to the muscles and stored up there, while another part circulates in the blood, combining with the oxygen to form heat.

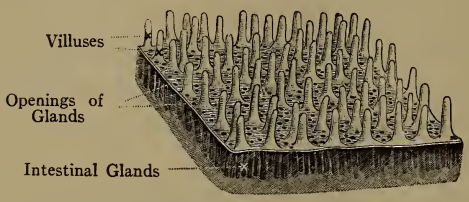


FIG. 40. — Mucous membrane of small intestine, showing intestinal glands and villuses.

HYGIENE OF THE DIGESTIVE SYSTEM

Care of the Teeth. — 1. The preservation of the teeth depends largely upon the enamel; if once injured, it is never restored. Do not crack nuts with the teeth nor bite thread; do not pick the teeth with pins or metal tooth-picks; avoid gritty tooth-powders; do not eat or drink food that is very hot, or very cold, or acid.

2. Chewing hard food aids materially the circulation in the teeth, and keeps them strong; too much soft food causes decay. Eat hard apples, crusts of bread, etc.

3. Brush the teeth night and morning, and after meals, especially at night, as otherwise the food from the last meal will remain in the teeth until morning. The teeth should

not be brushed sideways, but up and down. This method removes the food from between the teeth.

4. Use wooden or goose-quill toothpicks or dental floss.

A VIGOROUS USE OF DENTAL FLOSS.

Do this in the privacy of your room rather than at the table, or before other people.

5. The tooth-brush should be medium hard. If too soft it will soften the gums, and if too hard it will injure the gums, in either case causing bleeding.

6. Use a good tooth-powder, paste, or liquid cleanser. If the powder is gritty, it probably contains powdered pumice stone, which is destructive to the enamel if used daily. A good cleanser may be made up by any druggist from precipitated chalk and orris root, or a good castile soap may be used. The best of all is ordinary baking soda.

7. Have the teeth examined every six months by a good

dentist. He will find small cavities between the teeth which would otherwise remain unnoticed until too late. All cavities should be filled early, to avoid pain and to preserve the teeth. Pain or toothache is not present until the cavity extends to the dental pulp.

It is especially important for the milk teeth to be filled and saved until the proper time for them to be shed. If a

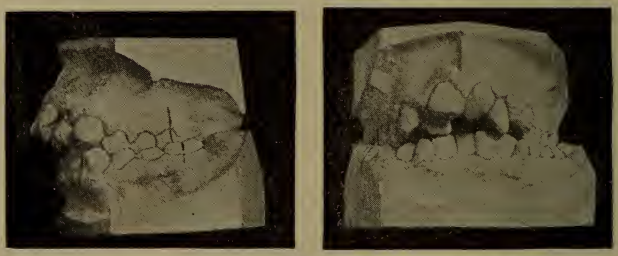


FIG. 41.— Plaster casts of crooked teeth caused by adenoids.
By permission of Dr. Roy Robinson.

child loses them too soon, the permanent teeth are not ready to come down, and there will be a malformation of the jaw and other bones of the face.

Decay of The Teeth. — Decay is caused by decomposition of food in the teeth, the heat and moisture of the mouth hastening this process; and by evaporation of saliva, leaving on the teeth a yellowish-white substance, called tartar. This is good soil for fungi and the germs of decay. During illness tartar collects rapidly, and the mouth should be washed out frequently with a good, antiseptic mouth-wash, such as listerine, or a solution of dioxogen. Excessive eating of candy is always apt to injure the teeth. The damage is done by the sugar which is left between

the teeth. It decomposes and forms lactic acid, which eats away the enamel. If the teeth are brushed after eating candy, this danger will be avoided.

Care of the Throat. — An ordinary sore throat is an inflammation of the pharynx. The *soft palate* or *uvula* frequently becomes relaxed and enlarged and, by touching the tongue, causes a constant, irritating cough. The tonsils may become inflamed, a condition known as *tonsilitis*. The use of the tonsils is not known. They are large in children up to the age of thirteen years, when they begin to shrivel, and in adult life they are quite small. They swell easily, and become hard and sore, making swallowing difficult. One attack of tonsilitis predisposes to another. After many attacks the tonsils remain large, blocking up the throat and interfering with respiration and swallowing. Tonsilitis is a serious disease, accompanied by constitutional symptoms such as fever, headache, general aching of the body, etc. The advice of a physician should always be obtained.

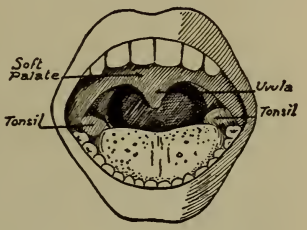


FIG. 42.— The normal tonsils.

Spongy growths, somewhat like the tonsils in structure, often appear in the back of the nose and the upper back part of the throat. These are *adenoids*. They generally grow over the openings of the Eustachian tubes, thus causing deafness. They block up the nasal passages, causing mouth-breathing, a nasal quality in the voice, and indistinctness of speech.

A schoolboy with adenoids becomes listless, inattentive, and indifferent, both in school and at play. His memory is poor and his mental capacity lessened — all this resulting from interference with the blood supply to the brain. He may even become deaf and lose the sense of smell and of taste, while earache, frequent colds, and indigestion are common results. His growth is stunted because of an insufficient supply of oxygen to the lungs.

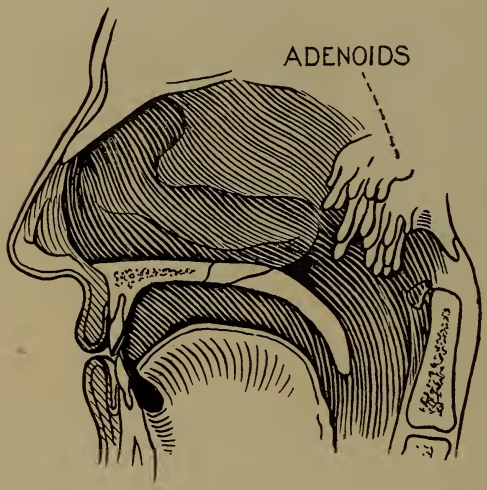


FIG. 43.

The signs of adenoids are mouth-breathing, a narrow, high roof to the mouth, irregular and prominent teeth, protruding eyes, nasal speech, and a tendency to frequent colds. Enlarged tonsils and adenoids should be removed by a nose and throat specialist. The operation is not at all dangerous and takes, in most cases, but a very short time. (Beware of so-called "specialists" or quack doctors, who advertise themselves in newspapers and public places.)

The change in a child after the removal of adenoids is sometimes amazing. An increase of from three to five inches in height, and six to twelve pounds in weight in a

year, is not uncommon. He breathes better, eats and sleeps better, grows faster, and often surprises his teachers by the rapidity of his progress in school. In a short time, with the teaching of hygiene, this scourge of childhood should be wiped out. When this is done, two-thirds of all the cases of deafness, one-half of all the cases of arrested development, and three-fourths of all the cases of backward children will disappear.

In *diphtheria*, a grayish-white membrane grows over the tonsils and pharynx. Sometimes it extends to the nasal passages and the larynx, in which case the patient chokes to death. The use of diphtheria antitoxin has greatly lowered the death rate of this much-dreaded disease.

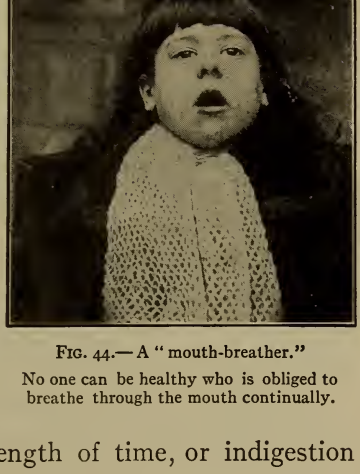


FIG. 44.— A "mouth-breather."
No one can be healthy who is obliged to breathe through the mouth continually.

Indigestion.—Food must pass along the alimentary canal within a reasonable length of time, or indigestion will result.

The symptoms of indigestion are:— Sour stomach, nausea, and vomiting, coated tongue, headaches, loss of appetite, offensive gases, constipation or diarrhea, obscure pain, at other times acute pain.

The Causes of Indigestion are:—

1. Eating too rapidly and not chewing sufficiently. If people would only learn to eat slowly and chew every

mouthful thoroughly, there would be very little indigestion. Much chewing means much saliva, and consequently a complete mixing of the food with it. The pleasurable sensation of taste is augmented by keeping the food in the mouth. To "Fletcherize" is to chew thoroughly. The word is coined from the name of Mr. Horace Fletcher of New York, who is an ardent advocate of thorough mastication. Copious drinking at mealtimes is bad. One should not drink more than a single glass of water at meals, as a larger quantity is apt to wash down large unmasticated pieces of food. Water should not be sipped with food, as the saliva is thus diluted. It is better to drink the liquid all at once, when there is no food in the mouth. The habit of chewing gum is particularly harmful, as it wastes a large amount of saliva. This juice on reaching the stomach, stimulates a corresponding flow of gastric juice, which in turn is wasted as there is no food to digest. When the next meal is taken, there is a resulting deficiency of these two juices, and indigestion results. Further, it is a vulgar habit which is extremely annoying to other persons who may be obliged to watch it.

2. Eating too much at one time causes the stomach to become distended, in which case it cannot perform its work properly. The muscular movements become slower and the flow of gastric juice reduced. The food is not digested, and nausea and vomiting with headache may result.

3. Eating an entire meal of one kind of food throws all the work of digestion on one digestive juice, while the others have very little to do. A meal of meat would throw most of the work on the gastric juice; one of starchy vegetables

would overwork the saliva and pancreatic juices, as would also too much candy and sweets. The latter should be eaten just after a meal in order to be digested with the other food.

4. Eating irregularly and between meals is very bad. Meals should be eaten at the same hour every day, with as little variation as possible. Indulging between meals gives the digestive organs no time to rest, the appetite for regular meals is dulled, and there is no flow of the digestive juices.

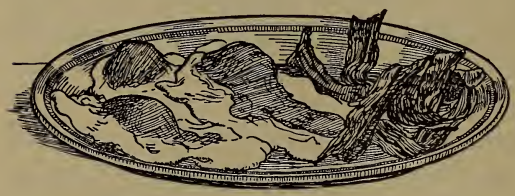
5. One of the most common causes of indigestion is iced drinks. A glass of ice water reduces the temperature of the stomach 30°, and it requires from one half hour to an hour to regain a normal temperature. If food is present, it simply lies in the stomach undigested till the temperature rises. In the summer time iced soft drinks are consumed in enormous quantities, especially soda-water, coca-cola, root-beer, etc. All these drinks in excess seriously impair digestion, and some of them contain injurious drugs.

6. Do not talk or think of unpleasant things at the table. The old adage, "Laugh and grow fat," is a good one. Be cheerful and talkative. Tell all your funny stories and take your time. Anger, quarreling, melancholy, sorrow, homesickness, and pain all interfere with the appetite and prevent digestion.

7. Poorly cooked or unappetizingly served food is bad for the digestion. Food must be pleasing to the sight and taste to induce a proper flow of the digestive juices. A soiled tablecloth, chipped and dirty dishes, with general disorder in the service will cause indigestion, as will also meat cooked to a cinder, potatoes water-logged, rice half-

raw, or food smothered in grease. A well-cooked meal, with the table linen spotless, the cutlery shining and clean, the dishes whole, the food garnished with celery, cress, or sliced lemon, and a centre-piece of flowers or ferns, will go far toward creating an appetite and aiding good digestion.

8. Exercise or study just before or just after a meal is bad. It takes the blood away from the digestive organs and interferes with digestion. At least a half hour should be allowed before and after a meal for freedom from all work, both physical and mental.



FOOD PREPARED UNAPPETIZINGLY.

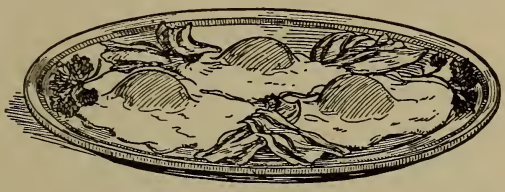
9. Lack of, or insufficient exercise brings on indigestion by causing a poor circulation often accompanied by a stagnant liver with its attendant sallow skin, a yellowing of the whites of the eyes, and constipation — in short, "biliousness." A marked yellowing of the skin is called jaundice.

10. Continued overwork and overstudy injure the nervous system and there follows a lack of nervous control over the digestive organs which is quite essential to digestion. Nervous indigestion is one of the hardest forms to cure. An example of a lack of nervous control is seen in "nervous diarrhea." This condition is often due to worry or great excitement over an impending event.

11. Poor eyesight, caused by constantly straining the eyes injures the nervous system and results in a lack of ner-

vous control, indigestion, leading to headaches, then to nausea, vomiting, etc.

Constipation. — Failure to evacuate the contents of the large intestine *daily*, results in constipation and causes much ill-health in schoolgirls and schoolboys. A daily movement of the bowels is absolutely necessary. Form a habit of evacuating the bowels at the same hour daily, preferably after breakfast. Much can be done by diet and exercise to prevent constipation. Coarse vegetables, fruit, and plenty of cool water between meals, with exercise in the form of walking, playing outdoor games, or housework in its various forms will usually be sufficient. There are times, however, when an occasional purgative or medicine to move the bowels is necessary. For this purpose the following drugs may be used: Castor oil, cascara, phosphate of soda, and magnesia. In the section on foods the laxative foods will be considered.



FOOD PREPARED APPETIZINGLY.

FOOD

Chemical Classification of Foods.—Food is any substance which, when taken into the body, repairs the waste and builds up the organism. All foods are divided into *proteids*, *carbo-hydrates*, *fats* and *oils*, *mineral matter* and *water*.

The Proteids.—The proteids are the foods which are flesh-makers. Examples: Lean meat of all kinds, albumen or white of egg, casein or the curd in milk and cheese, the gluten or sticky part of grains, and the legumen of pease and beans. These last are the vegetable proteids. As a rule proteids are constipating, because they are so easily digested and absorbed that there is very little residue left in the alimentary canal. They are absolutely necessary to the body, however, as they actually replace the dying

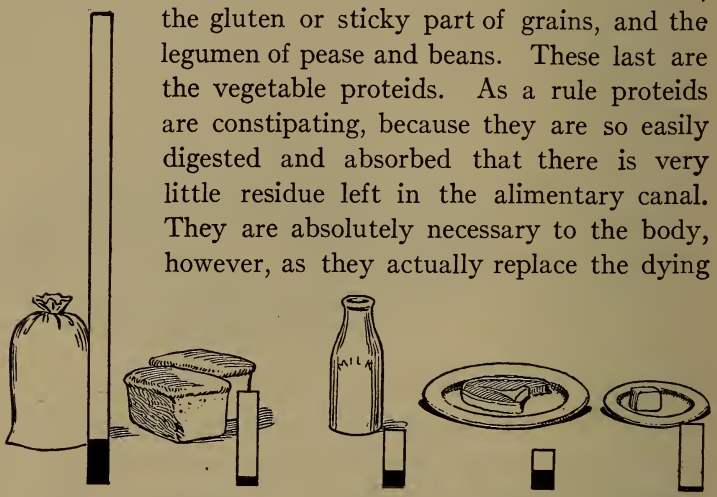


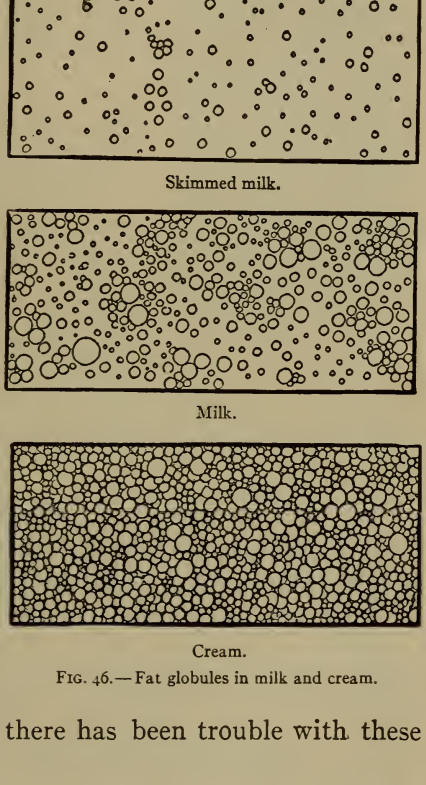
FIG. 45.—The shaded portion in the tubes represents the comparative nutritive value of various foods in the quantities shown.

tissues. The proteids are not fattening, but a person can withstand starvation a longer time on them than on any other class of foods.

The Carbo-hydrates.—The starches and sugars are the carbo-hydrates. They are burnt up in the body and become a source of heat and energy, while the excess is stored up as fat. Examples: Vegetables, fruits, and cereals all belong to this class. They usually leave a residue in the alimentary canal and are therefore laxative.

Fats and Oils.—These are also a source of heat and energy, and the excess is stored up as fat. Fats occur in

most animal food; oils, in vegetable food. Examples: Butter, cheese, cereals, nuts, fat meat, and fish, and oils such as olive, cotton-seed, and peanut. These foods by natural lubrication are laxative. Butter and cream are the best. Olive oil is hard to digest; no more than a teaspoonful should be taken at one time. Substitutes for butter are *butterine*, made from beef and pork fat; and *oleomargarine*, made from beef fat. They both have a good food value. It is only because they have been sold as butter, and have thus been made to command double their proper price, that there has been trouble with these products.



Skimmed milk.

Milk.

Cream.

FIG. 46.— Fat globules in milk and cream.

Water is necessary to the body. It helps to move the food along the alimentary canal; it helps also to dissolve the food, thus aiding the organs in their functions. It is found in all foods; beef contains 50% and potatoes 80% water. In addition to the water present in

food, about five or six glasses should be taken daily between meals.

Classification of Foods as to Kingdom.—*Animal foods:* Meat, fish, milk and cheese, eggs and gelatin.

Vegetable foods: Cereals, vegetables, legumes (pease and beans) and fruits.

Mineral matter: The most common mineral salts found in the body are lime, phosphorus, iron, and common salt. Lime is necessary for the bones; phosphorus is found in nerve tissue; iron, in the red blood corpuscles; while salt is present in all the secretions of the body, blood and tears being salty to the taste. Most of the food we eat contains salt and we consume on an average about a tablespoonful of this mineral daily.

Meats.—All meats are rich in proteids, but differ greatly in the ease with which they may be digested. Note the following:—

Meats easy to digest:	*Meats hard to digest:*
Raw oysters	Corned beef
Chicken	Veal
Beefsteak	Ham
Lamb	Lobster and crabs
Mutton	Pork
Bacon	Smoked and dried fish
	Liver, hearts, kidneys

Most meats should be under, rather than over cooked, so as to retain the animal juices, but should not be *raw*. Veal, mutton, fish, fowl, and pork, should be thoroughly cooked, as they may contain small parasites which can only be destroyed by thorough cooking. The Hebrews wisely forbid the use of pork.

Parasites in Meat.—A parasite is an animal or plant which derives its nourishment directly from another animal or plant. In pork we may have the *trichina spiralis*, so-called because the larva is curled up in a spiral. "Measly pork" contains thousands of white specks which are these little larval forms of the trichina. If this meat is eaten raw or half-raw, the larvæ are set free in the alimentary canal, where they grow and reproduce themselves. The eggs find their way out into the muscles, where they become encysted,—that is, a wall of tough membrane grows around each egg, forming a little case or "cyst"—and we have the little white specks again. This disease which is called trichinosis is very painful and may cause death.

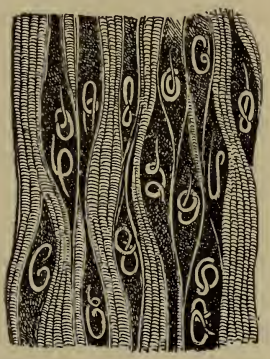


FIG. 47.—Trichina in pork.

In beef, pork, and fish, we may find the eggs of the *tapeworm*. This is a long, flat worm, like a piece of ribbon, sometimes reaching thirty to forty feet in length. It lives in the intestine of the human being and is very hard to dislodge, as it holds on to the mucous membrane by little hooks in its head. The tapeworm causes great pain and emaciation, with a ravenous appetite which cannot be

FIG. 48.—Tape-Worm. Note enlarged head at right

satisfied. If infected meats are thoroughly cooked, the eggs are rendered harmless.

Substitutes for Meat.— When the price of meat is high, it is well to know some other foods which contain the same kind of nourishment, namely proteids, and which may be used as substitutes. Beans and pease, macaroni and cheese, eggs, milk, oatmeal, and cornmeal are all excellent substitutes for meat.

Eggs are one of the most valuable foods, rich in proteid, fat, mineral matter, and salts. They are especially good for children. The white of egg, to be easily digested, should be soft, jelly-like, and tender. If boiled too long it becomes hard, opaque, and indigestible.

Tests for fresh eggs: Immerse in a bowl of water. If the egg sinks, it is fresh; if it floats, it is stale. If a fresh egg be shaken close to the ear, there will be just the slightest possible movement, or none at all.

Cereals. — Cereals are an important food, especially good for children. They contain proteids, carbo-hydrates and fats. The cereals are often, however, spoiled in the cooking.

Oatmeal must be thoroughly cooked. It should be soaked overnight, and cooked the following morning. It is one of the cheapest of foods, as it can be bought for five cents a pound. Cornmeal made into a mush and served with milk is a perfect food. Two pounds may be bought for five cents. Rice is rich in starch. It should always be steamed thoroughly. Hominy — a preparation of Indian corn — is a valuable food and may be served as a vegetable.

The *breakfast foods* which are sold so generally are, as a rule, wholesome enough, but one has to eat a large quantity at one time to get even a small amount of true nourishment.

Bread. — Bread and butter, with milk, make a perfect food. White bread contains more starch than other kinds; brown bread, more gluten or proteid. Hot breads are very indigestible; all bread should be at least one day old. Bread and molasses is good for children; the molasses is a laxative and contains much sugar. It may be served with cereals as well as with bread. Toasting bread partially digests it by changing the starch into sugar, a change which is noticeable in the sweet flavor of the crust.

Vegetables may be Heavy or Green.—The *heavy* vegetables are the roots and tubers. They contain more nourishment than the others, though they are generally constipating. Examples: Potatoes, beets. onions, parsnips, turnips, carrots.

The *green* vegetables are the leaves, stalks, or flowers of plants; they are generally laxative. Examples: Cabbage, cauliflower, spinach, celery, water-cress, lettuce and asparagus.

Certain vegetables have special properties as, spinach, which is laxative; asparagus, diuretic (causing increased activity of the kidneys); rhubarb — a good spring tonic, purgative; beets, very rich in sugar; potatoes, rich in potash just under the skin, to obtain which they should be cooked in their jackets.

A Mixed Diet the Best.—This fact is shown physiologic-

ally by the character of the teeth and of the alimentary canal, which indicate a provision for all kinds of food.

Examples of a mixed diet: Bread and butter, rice and milk, macaroni and cheese, fat pork and beans, lettuce and oil.

Fruits.—Fruits contain much water and mineral acids, and are valuable because the taste and odor cause the digestive juices to flow. Some fruits are laxative and some are tonic. The laxative fruits are: Figs, dates, prunes, apples, and oranges. Those containing the *most sugar* are apples, sweet cherries, grapes, and pears. Those containing the *least sugar* are plums, peaches, apricots, and raspberries. Grape-fruit, strawberries, and currants are acid fruits.

Bananas are very rich in starch and therefore should be fully ripe before eating. They are often indigestible because they are eaten too rapidly and swallowed in lumps. If eaten ripe and thoroughly chewed they are a good food. Pineapple juice contains a digestive ferment similar to pepsin, which digests proteids. All fruits eaten raw should be washed free o dirt and germs. Overripe or unripe fruit will cause indigestion.

Nuts.—These form an important food because they contain much oil and fat. There is one exception—the chestnut—which is rich in starch rather than oil and may be served boiled as a vegetable.

Some nuts are laxative, such as butternuts, English walnuts, and pecan nuts. They should always be eaten with a meal and not between meals. A little salt will increase their digestibility.

Adulteration of Food. — A food is said to be *adulterated*

when a cheaper material is combined with it, or some chemical used to preserve it.

Foods frequently adulterated with cheaper material are flour, coffee, cocoa, pepper, and olive oil. Many canned vegetables have sodium benzoate in them. Though the quantity is small, a persistent use will finally injure the body. Formalin is used to preserve milk. Copper is used in canning pease and beans to give these vegetables a brighter green color. Salicylic acid, alum, and aniline dyes are also used. Many cheap candies are brightly colored

COOKING LABORATORY, WILLIAM PENN HIGH SCHOOL FOR GIRLS.

with aniline dyes, some of which are poisonous. The recent national *pure food laws* should do much to lessen the wholesale adulteration of much of the food we eat, and to encourage the attention now being given to food sanitation.*

Cooking Makes Food More Digestible.—Cooked food

*Food and Drugs Act, June 30, 1906.

is more appetizing in taste and often in appearance. Parasites and germs are killed by the great heat in cooking.

Meats should be broiled, baked, roasted, or boiled — never fried. Frying coats the food with grease. It is difficult for the digestive juices to penetrate this coat of grease in performing their work of digestion.

Vegetables as a rule require a long time to cook. They should be boiled until tender.

Cereals should cook from one-half to three hours.

In making soups, the meat and vegetables should be put on in cold water and allowed to simmer, but not to boil. This process extracts all the essence from the meat.

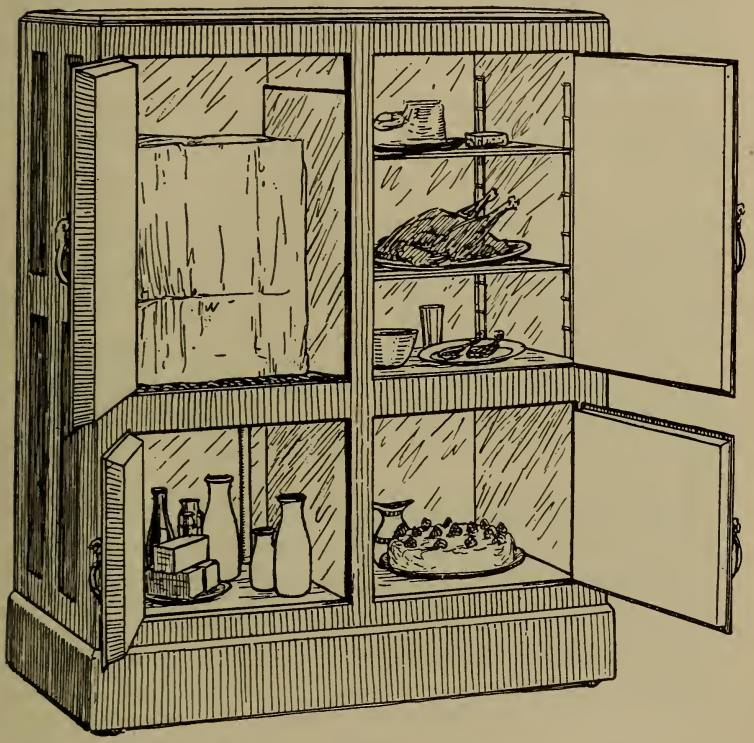
Diet for constipation: Brown bread, green vegetables, such as spinach, corn, tomatoes, beets, onions, with plenty of fruit, such as figs, dates, apples, oranges, and plenty of water. Coffee is laxative.

Diet for diarrhea: White bread, boiled rice, boiled milk, meat, eggs, pease, beans, and potatoes. Tea is constipating. All food should be taken lukewarm, never very hot nor very cold, as both heat and cold increase peristalsis.

Special Foods. — One often sees advertisements of skin food, muscle food, nerve and brain foods. No such foods exist. All food which is assimilated is converted into blood, and thus carried to all parts of the body alike. No one article of food may be said to nourish one particular organ, yet each cell selects from the blood exactly the ingredient needed for its own rejuvenation, — is, in other words, selective.

Condiments, such as mustard, pepper, vinegar, paprika, horse-radish, Worcestershire sauce, etc., are stimulants to the saliva and gastric juice, and whet the appetite.

Used in small quantities, they promote digestion; in excess they congest and inflame the mucous lining of the stomach.



A MODERN HYGIENIC HOUSE REFRIGERATOR.

Preservation of Food.—In order to preserve foods, they are put in cold storage, as cold prevents the growth of bacteria and molds. Meat and eggs are sometimes kept in this way for years and then unlawfully sold as fresh. Meats may also be dried, smoked or salted, to prevent the growth of bacteria.

Fruits and vegetables which have been partly cooked and then sealed in airtight cans and glass jars will keep indefinitely. When a can is opened the contents should be eaten at once. If any remains, it should never be returned to the can, as it may thus become poisonous.

Ptomaine or Food Poisoning. — Ptomaine poisoning may result from the use of canned fish, meat or vegetables, in which the bacteria were not all killed in the cooking. Ice-cream soured in the cans, and canned lobsters and crabs, are especially dangerous. The poisoning shows itself by severe, colicky pain in the abdomen, vomiting, diarrhea, and great prostration.

Avoid such combinations as ice-cream and shellfish, milk and cucumbers, oysters and sweet desserts, as the combination of these foods favors decomposition and poisoning may result.

School Breakfasts and Luncheons. — Many students do not eat enough breakfast. A roll and a cup of coffee or cocoa after fasting all night is not sufficient to sustain the body for from three to five hours of school work. A substantial breakfast or luncheon can be based on the following:

Breakfast Menus

1	2	3
Orange	Apple and grapes	Grape-fruit
Oatmeal	Cornmeal mush	Cream of wheat
Broiled chop	Bacon and egg	Broiled beefsteak
Bread and butter	Bread and butter	Baked potato
Cocoa or milk	Warm milk	Bread and butter
		Cocoa

Luncheon Menus

1	2	3
Soup	Soup	Soup
Fat pork and beans	Macaroni and cheese	Hot roast beef sandwich
Bread and butter	Bread and butter	Potato
Rice pudding	Orange and dates	Apple and figs
Cocoa	Cocoa	Milk

Overweight. — Some students show a tendency to overfatness, which is due—in part at least—to an improper diet and lack of sufficient exercise. The fat girl is usually of a calm temperament, with no tendency to worry. She rests frequently, sleeps well, moves slowly, and eats plenty of good, rich food. In order to reduce her fat she must observe the following rules:

1. Never sleep more than seven hours at night, and take no naps in the daytime. An exception must here be made of the schoolgirl; it is necessary for her to have eight or nine hours sleep for the proper performance of her school duties, and in order to study to advantage.

2. Exercise freely every day. Learn to move quickly and to keep moving all the time. Stand whenever possible, instead of sitting down.

3. Avoid sugars and starches. Drink as little as possible, and eat food dry. Avoid such articles of diet as cake, candy, ice-cream, milk and cream, rich soups, breakfast foods, heavy vegetables, and alcoholic beverages, such as wine and cider.

4. Take a cool sponge bath in the morning, followed by a brisk rub with a coarse towel, and some running exercises.

Underweight.—The thin girl is nervous; moves quickly; sleeps lightly; works hard all the time; worries over everything; and often has indigestion from eating too fast. In order to take on fat, she must observe the following rules:

1. Sleep at least nine hours at night and take a nap each afternoon.

2. Learn to move slowly, to rest frequently and relax every muscle.

3. Stop worrying and avoid thinking too long on any one subject.

4. Adopt a diet of cereals, starchy vegetables and fruits, fat meats, butter and cream, sweets, such as figs, dates, syrup and honey. *Avoid* acids, such as pickles, vinegar, etc., and green vegetables.

5. Take warm baths and keep the body warm and comfortable.

6. Secure plenty of sunshine and fresh air and, if possible, daily massage.

Beverages. — Beverages may be classified as foods and stimulants. *The food beverages* are milk, chocolate, and cocoa. The *stimulating beverages* are tea, coffee, and beef-tea.

Milk. — Milk is the most important of all beverages as well as the cheapest. It is the best single article in the diet for daily use. Its importance and cheapness have been overlooked and families would be better nourished if a part of the money which they now spend for meat were used to buy milk. During the first year of life it is a universal food, and agrees with all children. There may be exceptions to this rule, but they are very rare. Milk contains

proteid (casein), fat (cream), carbo-hydrates (milk-sugar), water and mineral matter (lime). It is a perfect food for children, but not for adults. If accompanied, however, by some starchy food, such as bread and potatoes, it forms a splendid food for the working-man. Its value lies, not in the fact that it is so highly nutritious, but that it is almost completely absorbed and digested; though, for this last reason, it is also constipating. Note the following:

A FIVE-MONTHS-OLD BABY WHO HAS BEEN FED ON NOTHING BUT MILK FROM BIRTH.

One quart of milk is about equal in food value to any one of the following: ¾ lb. of lean round beef; eight eggs; 2 lbs. of potatoes; 2 lbs. of chicken; 4 lbs. of beets or cabbage; 6 lbs. of spinach; ⅙ lb. of butter; ⅓ lb. of wheat flour; ⅓ lb. of cheese. — *The New York Milk Committee.*

Compare the prices of these foods with that of milk, consider the time needed to prepare them for the table, the amount of gas or coal required, the amount of waste, and then realize how cheap and good a food milk really is. Milk-borne diseases, moreover, are far less common than the under-feeding which results from the use of too little milk.

Skim milk is milk with the top cream removed. It contains all the nourishment of the whole milk but fat, — the element which supplies heat and energy.

Buttermilk is milk in which a bacteriological change has occurred, after the fat has been removed as butter. Buttermilk is as nourishing as skim milk and especially valuable as a germicide in the intestinal tract.

Condensed milk is milk which has been heated and evaporated to one-third or one-fourth its former bulk. It may or may not be sweetened; the unsweetened is better. It is usually diluted ten times and cream added, for infants one month old. Babies seem to thrive on it for a while. It makes them fat from excess of sugar, but the flesh is not firm. They develop poorly and are unable to resist disease, and finally develop the condition called rickets. It also causes lactic acid fermentation, diarrhea and inflammation of the mouth.

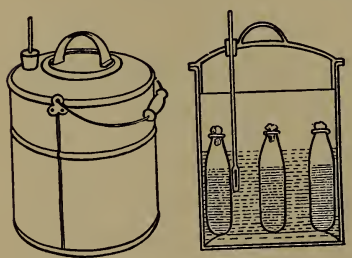


FIG. 49. — Sterilizing apparatus.

Modified milk is best for babies who have the misfortune to be deprived of mother's milk; in all large cities it may be obtained at modified milk stations or at any hospital. It consists of

cow's milk, cream, milk-sugar, lime water, and plain water, in certain proportions, according to the age of the child. It is simple to prepare and is, by far, the best and safest food for infants. The Health Department issues circulars giving directions for its preparation.

Fig. 50.— The black square represents the bacteria in un-Pasteurized milk. After Pasteurization the bacteria are reduced to the amount indicated by the white square.

(By permission of Dr. H. L. Russel.)

Pasteurized milk. The name is derived from a French investigator, Louis Pasteur, who invented the process. The milk is heated to 168° Fahr. and kept at that point for twenty minutes. This process kills many bacteria which produce souring of the milk and most of the disease-producing bacteria. Pasteurizing milk delays souring and does not affect the quality in any way. Boiling absolutely kills all germs, but it also changes the composition of the milk, making it harder to digest and more constipating.

Adulteration of milk. Milk is often watered, and sometimes chemicals, such as formalin, are added to make it remain sweet. This adulteration is forbidden by the Food and Drugs Act; and there are now in all large cities inspectors whose duty it is to examine all milk sold there.

Diseases conveyed by milk.— Many diseases are conveyed by milk, the most important being tuberculosis, typhoid fever, diphtheria, scarlatina, and tonsilitis. Cows suffering from tuberculosis will give tubercular milk, the use of which will produce tuberculosis in the human being. All large dairy herds are now examined periodically by what is called the tuberculin test. If the test is positive,

Used by courtesy of Brookside Farms.

A SANITARY BOTTLING ROOM. (*Notice the hygienic costumes of the men.*)

the cattle are killed. The utmost cleanliness is also observed in all large dairies. The stables are kept clean, the milkers wear sterilized gloves, and the milk is put up in glass bottles, sealed with paraffined paste-board tops. This precaution prevents dust and dirt from getting into the milk. When the germs of infectious diseases, such as typhoid, diphtheria, and scarlatina, are present in milk they

find their way there, not from the cow, but from uncleanliness somewhere between the dairy and the consumer: it may be from dirty hands, clothing or water; from flies; or

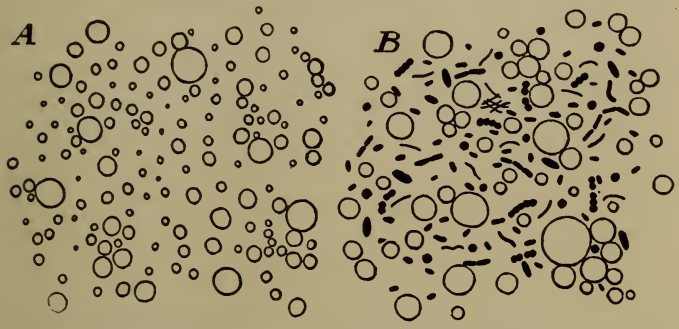


FIG. 51.—A, clean milk, showing no bacteria; B, dirty milk, containing many bacteria.

from dirty vessels for holding the milk. The germs thrive in milk, reproduce very rapidly, and are easily carried in the milk to the consumer.

Other Food Beverages. — Chocolate and cocoa are both food beverages, made from the seeds of the cacao tree. Chocolate contains starch, proteid, and a large percentage of fat. Because of its richness, the fat is removed from chocolate by certain processes and cocoa is the result. Cocoa is not so rich as chocolate and is a good drink for children.

The Stimulating Beverages. — These are tea, coffee, and beef-tea. Stimulants have no food value in themselves, but hasten the action of the digestive fluids.

Tea is the dried leaves of a bush grown in China and India. There are two varieties — green and black. Green tea has been prohibited in the United States by a recent law, which

went into effect May, 1912. The green color is caused by drying the tea on copper plates, a process which renders the tea injurious. Tea contains *tannic acid*, an astringent which injures the lining of the stomach and intestines, and *theine*, the active principle, which gives the stimulating quality. If tea is boiled, a much larger amount of tannin is liberated and the bad effect is increased. In excess, tea causes indigestion, flatulence, constipation, and nervousness. Tea retards the action of the saliva; therefore, if tea is taken, it should not be sipped with a meal, but should be drunk after all the food is eaten.

To make tea properly, first scald out the teapot with boiling water to heat the pot; then add freshly-boiled water to the leaves in the proportion of one teaspoonful to each person; allow it to steep for a few minutes, and pour it off. By this method but little tannin enters the decoction. Sugar and milk added to tea increase its food value.

Coffee is the roasted berry of a plant grown mostly in Porto Rico and Brazil. It contains *tannic acid* — an astringent — and a substance called *caffeine*, which gives the stimulating quality. Black coffee contains an extra amount of tannin. Sugar and milk or cream increase its food value, though some authorities maintain that milk makes it more indigestible. Coffee is laxative; in excess it causes palpitation of the heart, irregular heart-beat, nervousness, and insomnia or sleeplessness.

Beef-tea is valuable as a flavoring agent or as a stimulant, not as a food. A dog fed entirely on beef-tea will starve to death in a month. It contains the extract and flavor of the meat without the coagulated albumen which represents

the real food value. It stimulates the digestive juices to work on the food which may be eaten later.

A better product than beef-tea is *beef juice*, which is a true food. This may be prepared by broiling a beefsteak slightly to free the juices and then squeezing the juice out, adding salt and serving at once. One pound of lean meat yields about three or four ounces of juice.

VI. — THE CIRCULATORY SYSTEM.

PHYSIOLOGY OF THE CIRCULATORY SYSTEM

The Circulatory System. — The circulatory system consists of the *heart*, *arteries* and *veins*, *capillaries* and *lymphatics*.

The heart is the pump which keeps the blood in motion. The arteries carry pure oxygenated blood to the organs. The veins and lymphatics carry impure blood back to the heart. The capillaries connect the arteries with the veins.

The *spleen* is a dark red organ lying to the left of the stomach, in the abdominal cavity. Its exact function is not known, but it is supposed to manufacture the blood corpuscles. In certain blood and infectious diseases, as in typhoid fever, the spleen becomes very much enlarged.

The *ductless glands* are the *thyroid*, at the base of the neck, the two *supra-renal capsules* lying just above the kidneys, and the *pituitary body* at the base of the brain.

The thyroid, or most important of these glands, is a flat, two-lobed gland at the base of the neck in front of the trachea. When it becomes enlarged, it produces a condition called *goitre*. If it is entirely removed, the patient will not survive. It secretes a fluid which has something to do with the growth and development of the body; when this fluid is lacking, the deficiency may be supplied by the patient's taking thyroid extract. This extract is ob-

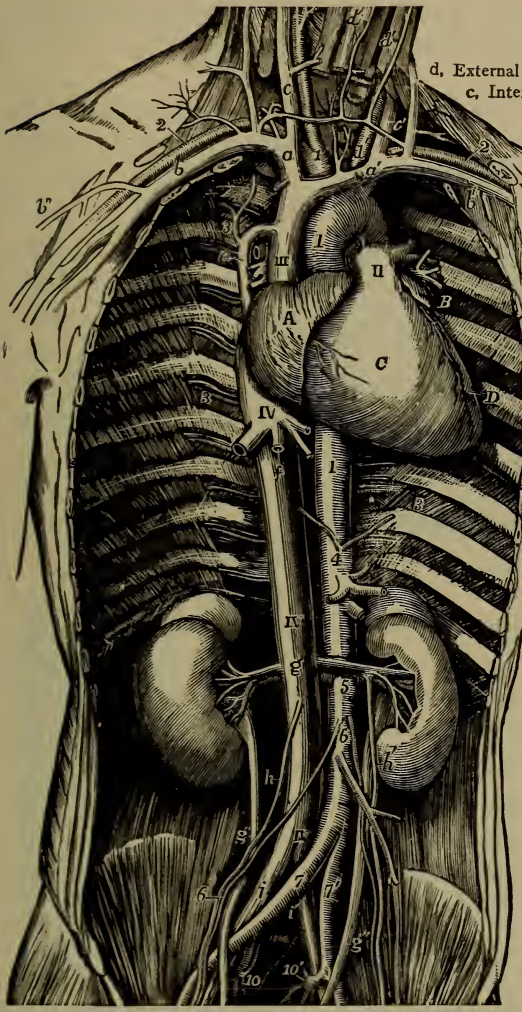


FIG 52.—Distribution of arteries and veins.

tained from calves, pigs, and goats, is especially prepared, and should be administered only by experts.

Blood. — The blood is composed of a colorless liquid called *plasma*, in which float millions of little bodies called red and white blood corpuscles.

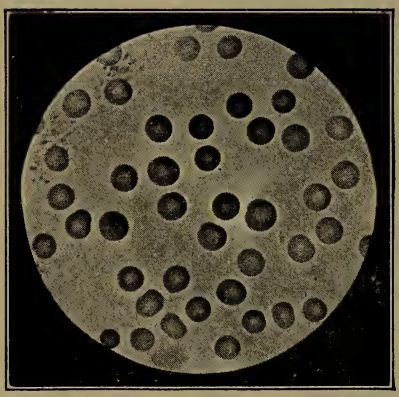


FIG. 53. — Red blood cells.

The red corpuscles are five hundred times more numerous than the white. They are plate-like little bodies which give the red color to the blood. They are full of hemoglobin — the coloring matter of the blood, — and carry oxygen to the tissues to build them up.

The white corpuscles are two or three times as large as the red. Since they are transparent they have to be stained in order to be seen under the microscope. They are the *phagocytes*, or fighting soldiers of the blood, as they eat up and digest disease germs. Wherever there is inflammation, the phagocytes gather in large numbers. When they die they form *matter* or *pus*, such as may be seen in a boil or abscess.

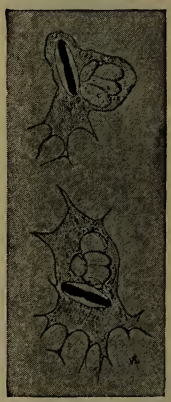


FIG. 54.—White blood cells destroying bacteria.

Blood corpuscles are made in the red marrow of the long bones, in the lymph glands, and probably in the spleen also.

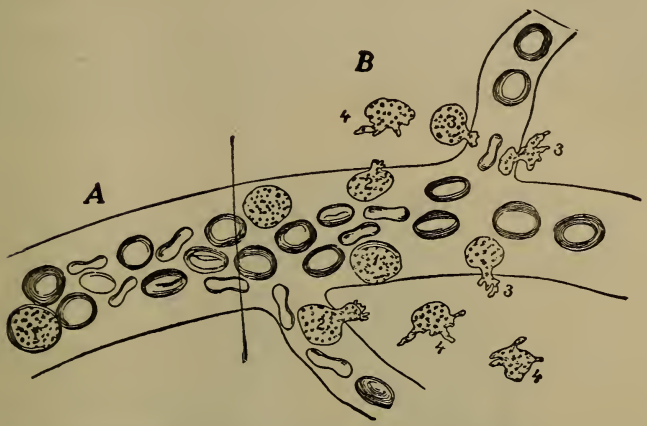


FIG. 55.— Escape of white corpuscles from a small blood vessel, (Hall). At A the conditions are normal, but at B some excitation in the surrounding tissue leads to a migration of corpuscles. 1, 2, and 3 show different stages of the passage.

Uses of the Blood. — The blood feeds the tissues with the digested food (plasma) and with oxygen (red corpuscles), regulates the heat of the body and, gathering waste material from the tissues, carries it (lymph) to those organs whose function it is to expel it from the body.

Clotting. When exposed to air, blood separates into a thick, jelly-like mass called the clot, and a yellowish fluid called *serum.* The clot consists of the corpuscles entangled in a substance called *fibrin.* The serum is mainly the plasma. Clotting is Nature's method of stopping bleeding.

Arterial and Venous Blood. Arterial or pure blood comes from the heart, is bright red in color, and rich in oxygen. *Venous blood* goes to the heart, is dark purple in color, and

full of carbon dioxide,—a poison which is gathered from the tissues after they have used up the oxygen.

The Heart.—The heart is a conical organ, about as large as the fist, placed in the middle of the chest between the lungs. It is composed of involuntary muscle and is very strong. It has four cavities. The upper two are small and

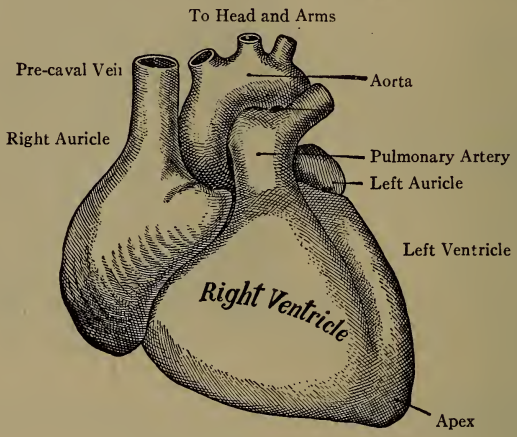


FIG 56.—The heart, from the front.

are called *auricles;* the lower, *ventricles.* The left ventricle has the thickest walls, because the blood is pumped from it into the great artery, the *aorta*, to be distributed to the various parts of the body. Between the auricles and ventricles and between the ventricles and the great blood vessels are delicate little valves of membrane, which allow the blood to pass in only one direction. Any disease of these valves, upsetting the regular flow of the blood, causes serious disorder.

The *pulse* records each wave or impulse of blood passing

through the arteries; its beat keeps time with the beating of the heart. It may be felt best in the *radial* artery at the wrist and the *carotid* artery on either side of the throat. It is caused by the heart forcing, at every beat, about six ounces of blood into the *already filled* great arteries (pulmonary and aorta) at the base of the heart.

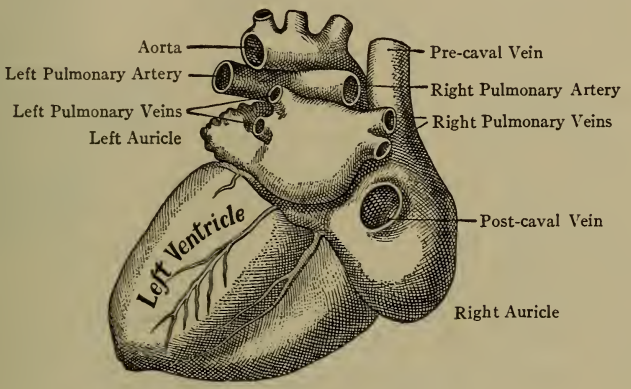


FIG. 57.— The heart, from behind.

The arterial walls, *being elastic*, expand to accommodate this increased supply of blood. The character of the pulse is very important, since sickness always affects the heart, and much may be learned from the variations in strength and frequency of the pulse.

The Arteries.—The arteries are elastic and muscular tubes which carry the blood from the heart. The first and largest artery proceeds from the left ventricle and is called the *ascending* aorta. It ascends for about two inches, then arches over behind the heart and passes down through the diaphragm, dividing in the lower abdomen into the two

large arteries, which eventually go, one to each leg. From the arch of the aorta large branches arise which supply the head and arms. From the *descending* aorta, other large branches supply the abdominal organs.

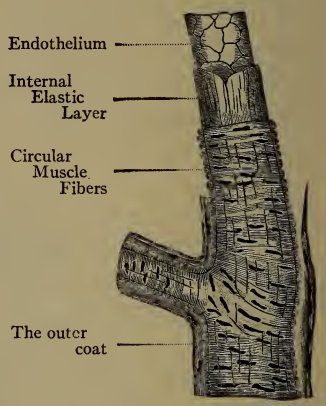


FIG. 58.— Coats of a small artery.

The Capillaries.— These are very minute vessels which connect the small ends of the arteries with the beginnings of the veins. The walls of the capillaries are very thin, allowing the plasma, which becomes *lymph* in the tissue cells, to filter through. The corpuscles cannot pass through, but the oxygen, being a gas, readily passes through the capillary walls and enters the lymph, which bathes the cells of the tissue. Carbon dioxide then passes back through the walls into the blood. This exchange of gases takes place between the blood and the tissues.

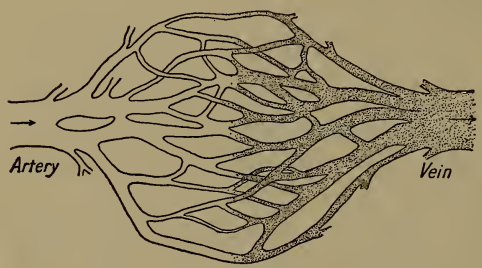


FIG. 59.—Artery, Capillaries, and Vein. The shading indicates the change in the color of the blood.

The Veins.— The walls of the veins, which carry venous blood to the heart, are thinner than those of the arteries. The two largest veins collect

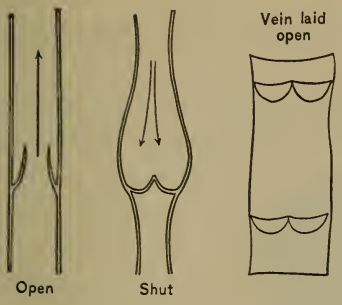


FIG. 60.— Valves of the veins.

the venous blood from the head, arms, trunk and legs. The veins are supplied with little valves, which allow the blood to flow in only one direction, that is toward the heart.

Circulation of the Blood.— The blood is forced from the left ventricle into the aorta, and finally through smaller arteries and capillaries to the tissues. It is taken up from the tissues by the small veins and lymphatics, and finally emptied as impure blood into the right auricle. It then passes into the right ventricle, through the pulmonary artery (the only artery carrying impure blood) to the lungs, where it is oxygenated. From the lungs the purified blood is collected, passed through the pulmonary veins (the only veins carrying pure blood) into the left auricle, then into the left ventricle. The passage of the blood through the lungs is called the *pulmonary circulation;* the passage through the body and back is called the *systemic circulation.*

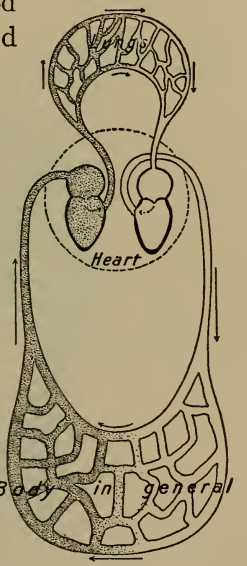


FIG. 61.—Diagram of the circulation, showing in general the work done by each part of the heart. The right ventricle forces the blood through the lungs and into the left auricle. The left ventricle forces blood through all parts of the body and back to the right auricle. The auricles force blood into the ventricles.

The passage of blood from the

abdominal organs through the portal vein to the liver is called the *portal circulation.*

The Lymphatic System.—The lymphatic system consists of *lymph spaces*, *tubes* (*lymphatics*) and *glands*. When the

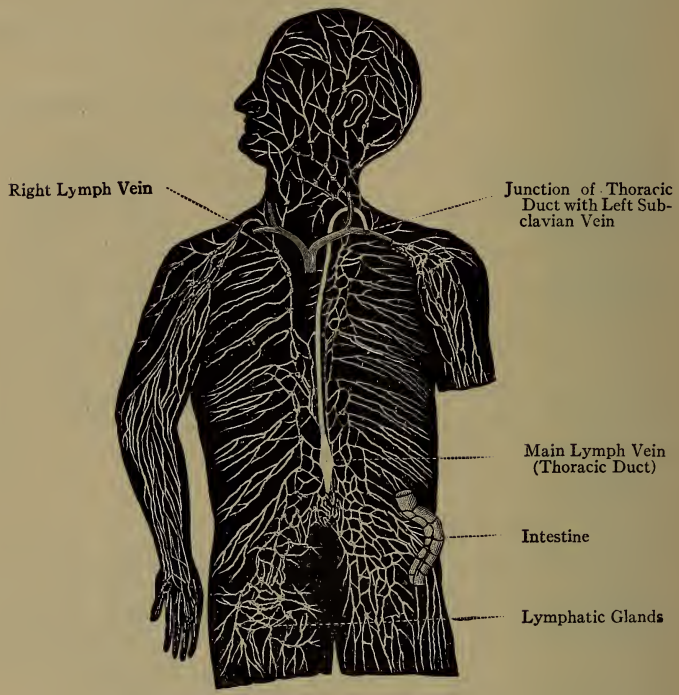


FIG. 62.— Lymph veins (lymphatics).

blood plasma filters through the capillaries or tiny blood vessels and bathes the cells of the different organs, it is called lymph. Lymph conveys material from the blood for building up the tissues, and collects the waste materials.

The lymphatics are small tubes which collect the lymph

when filled with waste products from the blood. These tubes finally unite in the left and right thoracic ducts, which empty into a large vein in the neck.

The lymphatic glands are enlargements of the lymphatic tubes; their function is to strain out bacteria or any harmful substance in the lymph. They are especially numerous under the arms, in the groins, and in the neck. The white blood corpuscles are manufactured in these glands.

Any infection in any part of the body is always followed by enlargement of the nearest lymph glands in their efforts to strain out and destroy the bacteria in the lymph. A decayed tooth will cause enlarged glands under the jaw, and an infected hand will cause enlargement of the glands in the arm-pit. Enlarged glands on the side of the neck are often tubercular and the condition is called scrofula.

One of the greatest benefits derived from exercise is the increased circulation of lymph in the lymph spaces and a more rapid carrying off of impurities. Passive exercise or massage has the same effect.

HYGIENE OF THE CIRCULATORY SYSTEM

The Quantity of Blood and its Distribution.—The body contains between five and six quarts of blood. The harder an organ works the more blood it requires. The whole amount of blood in the body cannot be suddenly increased, but the muscular coat of the arteries supplying any one organ may temporarily relax and allow more blood to pass through it, other organs receiving proportionally less, meanwhile. While one is studying, the brain gets more blood

than usual; during exercise the muscles get more; when digestion is in progress, the digestive organs get more than other parts of the body.

Purification of the Blood.—Good food, pure air, sleep, and plenty of exercise are necessary for healthy blood. Patent medicines are sold as "blood purifiers" but such remedies are not to be relied upon. The blood is purified, not by putting anything into it, but by extracting the impurities as it passes through the skin and kidneys, lungs and liver.

A few hours after food is eaten, the nutritive material in the blood is found to be increased. Pure air brings an increased supply of oxygen to the red blood corpuscles and the escape, in the form of carbon dioxide, of the impurities.

Sleep permits the exhausted blood cells to be repaired and renewed because the blood is not then being used by any organ. Loss of sleep is shown by a pale skin, which indicates the depleted condition of the blood.

Exercise improves the circulation in the following manner: During exercise the muscles use more oxygen, thus causing a more rapid extraction of waste material. The muscles demand more oxygen and consequently more blood. Through certain nervous impulses, the heart beats faster in order to drive a larger volume of blood through the lungs to be purified and carried to the hungry muscles.

Excessive exercise may injure the heart by dilating it or by making it enlarge too rapidly. This condition is often found in athletes and gymnasts.

Exposed Places of Main Arteries.

Disease of the Heart.—The strenuous life led by many people to-day causes the heart to wear out too soon. The delicate valves in the arteries and veins often become the seat of inflammation following infectious diseases, such as typhoid fever, rheumatic fever, diphtheria, and influenza, and the valvular action becomes insufficient, resulting in a leakage of the blood backward. Palpitation of the heart may indicate disease of the organ, or it may be due to indigestion, but in either case a physician should be consulted. Boys and girls suffering from heart trouble should lead quiet lives and avoid excessive exercise, such as dancing, skating, gymnastic work, and running upstairs.

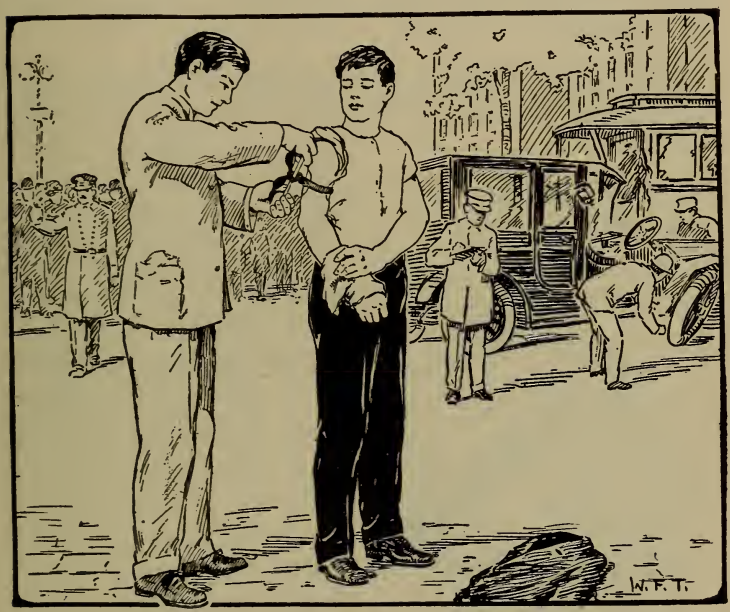
In old age the arteries lose their elasticity, and become hard and brittle. When an artery in the brain breaks, a hemorrhage follows, a clot forms, and the patient has a "stroke of apoplexy," or paralysis of one side of the body.

Hemorrhage.—A *bruise* is due to hemorrhage from the capillaries under the skin. Apply hot water and gentle massage. For *ordinary bleeding*, wash with clean, cold water, whereupon the blood will form a clot and the bleeding will stop. Ice or very hot water will help to stop the oozing from any surface.

In case of bleeding from a large wound, arterial blood may be recognized by its bright red color and by the fact that it comes in spurts, corresponding to the heart-beat. Pressure should be applied on that side of the wound next the heart. In the case of venous blood, which is dark red or purple and flows slowly, pressure should be made on the side away from the heart. Very strong pressure may be obtained by means of a *tourniquet*, which consists of a bandage of any

kind tied in a knot through which is thrust a stick. The stick is then twisted as the spoke of a wheel, until the bandage becomes tight enough to stop the bleeding.

The adult body contains about five or six quarts of blood. A hemorrhage of a quart is not necessarily serious,



STOPPING HEMORRHAGE BY MEANS OF A TOURNIQUET AS FIRST AID IN AN ACCIDENT.

and three quarts may be lost without resulting in death. As a last resort when a person has lost much blood, the loss may be made up by injecting a solution of salt, called *normal salt solution*, into the bowel, the veins, or under the skin. Of course, this must be done by a skilled physician.

Inflammation.—This is congestion of the blood in a

part where the vessels are so strained or injured that the red corpuscles pass through the capillary walls into the tissues. It is always accompanied with heat, redness, pain, and swelling. The names of diseases ending in "*itis*" mean an inflammation of the part named: as, tonsilitis, inflammation of the tonsils; appendicitis, inflammation of the appendix.

Antitoxins, Vaccines, and Bacterins. — Disease germs often get into the blood. When this happens the white blood corpuscles multiply and literally "eat them up." There are also substances formed in the plasma to fight against disease, which may be called antitoxins or bacterins. These antitoxins are also found in the lower animals, and because of this fact the blood serum of certain animals is used to increase the power of the human body to combat disease; for instance, in such diseases as diphtheria, hydrophobia, pneumonia, and tetanus, injections of animal serum have been made with great success, and have saved thousands of lives. It is possible that in the future all diseases will be treated in this way.

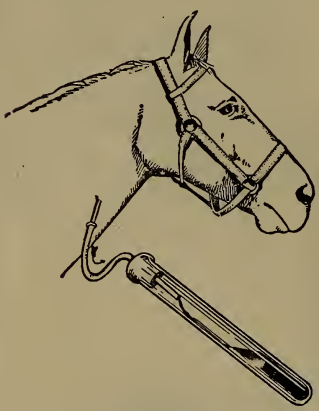


FIG. 63.— How antitoxin is obtained from an inoculated horse.

VII. — THE RESPIRATORY SYSTEM.

PHYSIOLOGY OF THE RESPIRATORY SYSTEM

The Respiratory System. — The respiratory system consists of the *nose*, *pharynx*, *larynx*, *trachea* or *windpipe*, *bronchi* and *lungs*.

The Nose.—The nose consists of two passages, separated by the *nasal septum*, opening at the back into the pharynx. The passages are lined with a delicate membrane which secretes *mucus*. This secretion has the power of destroying germs. The membrane contains hairs and little processes called *cilia*, *or ciliumns*, which help to strain dust and dirt from the air.

The *nasal duct* carries the tears from the inner corner of the eye into the nose. In weeping, the tears overflow, because the duct is too small to contain them all.

The nerve of smell is distributed throughout the membrane in the upper part of the nose.

FIG. 64.— Model of section through the head, showing upper air passages and other parts. 1. Left nostril. 2. Pharynx. 3. Tongue and cavity of mouth. 4. Larynx. 5. Trachea. 6. Œsophagus.

The Pharynx. — The pharynx, popularly called the throat, is the large cavity back of the mouth into which the nasal passages open. The *Eustachian tubes*, leading from the middle ear, open into the upper part of the pharynx; the œsophagus and windpipe open from the lower part. On each side of the root of the tongue is one of the *tonsils*, while a third, or *lingual tonsil*, is present at the middle of the base of the tongue. The *uvula*, a little soft, red body, hangs down from the soft palate.

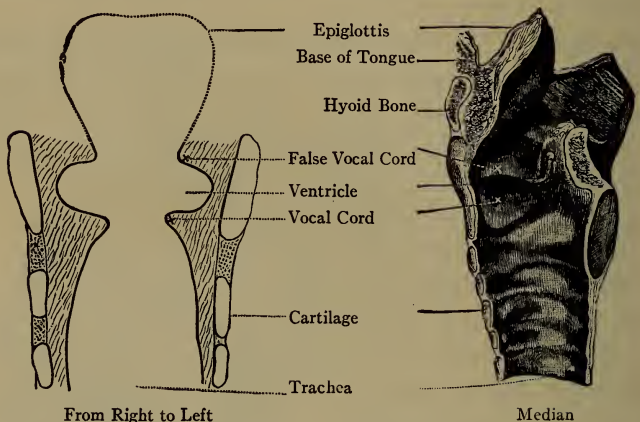


FIG. 65.— Longitudinal sections of the larynx.

Larynx. — At the top of the trachea is the cartilaginous larynx, or voice-box. It shows on the outside as the Adam's apple. The trachea is covered by a lid called the *epiglottis*. It closes by a sort of hinge at the front, thus allowing the food to pass down over it, when closed. Inside the larynx are the two vocal cords, stretched from front to back. The passage of air between the vocal cords causes them to vibrate, thus producing the *voice*. When these

sounds are modified by the lips, teeth, palate, and tongue, *speech* is the result. In men, the voice is deep because the cords are longer and wider apart. The shrill, high-pitched voice of women is due to their shorter vocal cords.

When the nose is stopped up and we use the mouth in breathing, we say the voice is nasal. The term is a misnomer, as the voice, under such conditions does not pass through the nose at all. A hoarse voice is due to the swelling and inflammation of the cords.

The Trachea. — The trachea is the windpipe. It is about four inches long and is composed of incomplete, or C-shaped rings of cartilage, the opening of the C being toward the back to allow room for the expansion of the œsophagus when it is full of food. On entering the chest the trachea divides into the right and left bronchi, and these in turn subdivide into the bronchial tubes. The trachea and bronchial tubes are lined with ciliated mucous membrane similar to that in the nose, which helps to strain out any dust or foreign particles in the air passing through them.

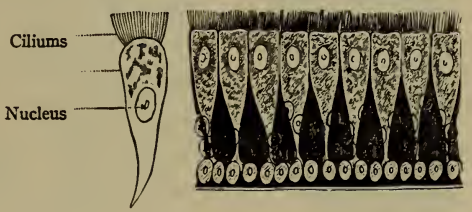


FIG. 66.— Ciliated cells lining the air tubes (x 300).

The Lungs. — The two lungs, with the heart, great blood vessels, and œsophagus, occupy the entire chest cavity. The lungs are pinkish, spongy organs, covered with a smooth, glistening membrane called the *pleura*. The

chest wall is lined with the same membrane. The bases of the lungs rest on the diaphragm, the large muscle which separates the chest from the abdomen, while their apices rise about an inch above the collar-bone on either side. The bronchial tubes subdivide repeatedly, until they finally end in the groups of air-cells of which the lung substance is composed.

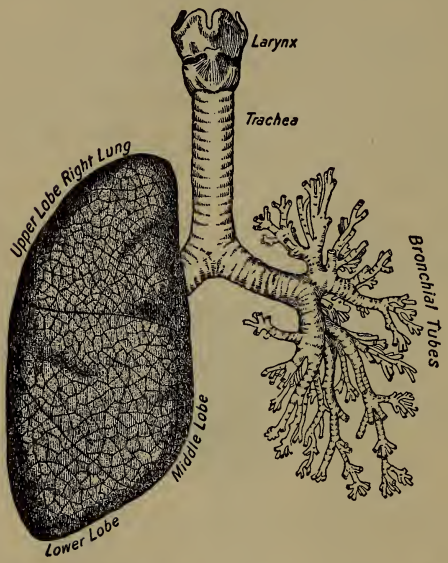


FIG. 67. — Lungs and air passages seen from the front. The right lung shows the lobes and their divisions, the lobules. The tissue of the left lung has been dissected away to show the air tubes.

Purification of Blood.—The walls of these air-cells are as thin as tissue paper and are covered with a network of capillaries. The oxygen in the inspired air passes through these walls into the red blood corpuscles, while the carbon dioxide in the impure blood passes through these walls in the opposite direction into the air-cells and is finally expired. The air supply must be constantly changed, and this is done by the aid of certain muscles, the movements of which constitute *breathing*.

When the cavity of the chest is enlarged by the action of the diaphragm and the muscles attached to the ribs, air

flows into the lungs, filling them, and we have *inspiration*. When these muscles relax and the pressure of the ribs on the lungs causes the air to be breathed out, we have *expiration*. This occurs, normally, about fifteen times a minute.

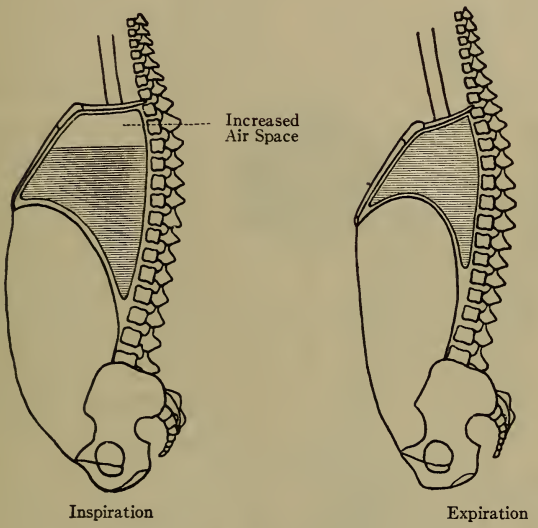


FIG. 68.— Sections of the body in inspiration and expiration.

Expired air is warmer than inspired air and it contains impurities and water.

Lung capacity. In ordinary breathing, about one pint of air passes in and out at each inspiration and expiration, respectively. The *vital capacity* of the lungs is the quantity of air breathed out by the deepest expiration following the deepest inspiration. It is usually about four quarts for adults. There are various instruments in the gymnasium for measuring this amount.

HYGIENE OF THE RESPIRATORY SYSTEM

Healthy Lungs.—The lungs, to be healthy, must be used to their fullest extent. Any part of the lungs not used will collapse and become in a sense solid and of no use. Deep breathing every day will go a long way toward keeping a person perfectly healthy.

THE "DÉBUTANTE SLOUCH," A POPULAR, BUT UNHYGIENIC WAY OF CARRYING THE BODY.
(In this position it is impossible to inflate the lungs fully. Note the unhygienic shoes.)

Exercise, either in work, games, or gymnastics, causes deeper breathing than usual, which means that more blood is sent to the lungs to be purified.

Round shoulders and weak backs may be corrected by breathing exercises combined with arm movements upward and downward, outward and inward. At the United States Military Academy at West Point there is a "setting up drill" for this express purpose.

Tight corsets interfere with the upward and downward

movements of the ribs and the downward movement of the diaphragm, so that the bases of the lungs are compressed and used but little. As the pressure is uniform, the wearer soon adapts herself to it and imagines she is comfortable. Tight corsets not only interfere with respiration, but also with the action of the heart. They displace the abdominal organs, especially the stomach and liver. Girls and women who voluntarily tighten the waist show their ignorance, foolishness, and lack of the artistic sense of proportion. All the great statues of antiquity, which are still the highest ideals of beauty, have large waists; for example, the Venus de Milo, (p. 48) or the Winged Victory of Samothrace.

Children's clothes should be supported from the shoulders and hips, never by the waist.

FIG. 69—A hygienic corset waist suitable for growing girls.

Varieties of Breathing. — *Pectoral breathing* is seen in women who wear tight corsets. None of the movements in the lower chest and in the bases of the lungs are used.

Abdominal breathing is seen in some men who have

round shoulders and flat chests from tight suspenders. Men of this figure do not use the apices of the lungs.

Diaphragmatic breathing is the normal type in which the lungs as a whole are used.

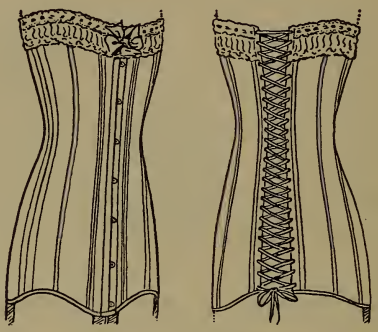


FIG. 70—A hygienic corset.

Shortness of breath may be due to severe exercise, or may result from disease of the heart, kidneys, or lungs. A physician should always be consulted to ascertain the cause.

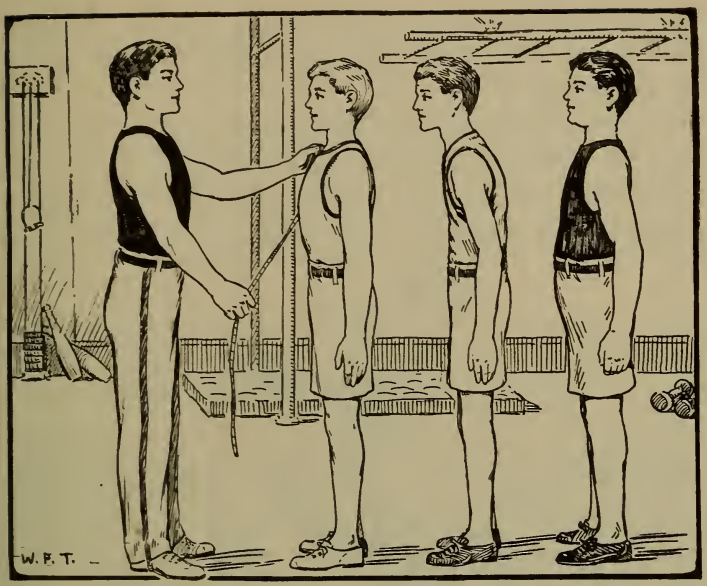
Coughing is a forced expiration in which the larynx is suddenly opened wide, generally to expel mucus from the lungs.

Sneezing is a sudden expiration in which the air is driven mainly through the nose.

Hiccoughing is a sudden inspiration due to spasm of the diaphragm.

Snoring is caused by long inspirations and expirations with the mouth open. Part of the air passes through the nose and part through the mouth, causing a vibration of the soft palate.

Artificial Respiration. — In certain conditions, such as partial drowning, partial suffocation, snake-bite and light-



EFFECT ON THE CHEST OF DEEP, SHALLOW AND ABDOMINAL BREATHING.

ning-stroke, the muscles of respiration cease to act. By using some artificial means of inducing breathing, the nerve cells controlling the function may be made to start working again.

In such cases lay the patient on his back and place a folded coat under the shoulders, thus raising the chest while the head falls back. Grasp the arms at the wrists and raise them above the head, then gently lower them to the sides. While the arms are being lowered an assistant presses on the lower part of the ribs, thus helping to drive out the air. This action must be repeated from twelve to fifteen times a minute and should be kept up for as long as five hours, if necessary, as resuscitation has been accom-

plished after the lapse of that length of time. A newer and better method of producing artificial respiration is the following :—

Treat at once on getting the patient to land. Lay him face downwards but with the head turned to the left side, and drain the water from the lungs by lifting the body at

FIRST STEP TOWARDS RESUSCITATION IN DROWNING ACCIDENT.

the waist line and jerking it two or three times up and down. This process should take about thirty seconds. Kneel down between the legs of the patient and place both hands over the small of the back, with thumbs nearly touching, and fingers spread out over the lower ribs. Swing forward, counting three slowly, and bring pressure to bear

on the ribs to expel the air. Then swing quickly backward, releasing the pressure, but keeping the hands in the original position and the arms straight. Count three slowly in this position and then repeat the first movement. This should be done ten or twelve times a minute, without pausing between movements. The English Government Life Saving Service and other English Societies are now using this method and American Societies have it under consideration.

Sometimes drawing the tongue in and out aids in establishing breathing. Another person should be rubbing the limbs, while dry blankets and hot-water bottles should be obtained as quickly as possible. Keep up the artificial respiration for five hours, if necessary, for as was said, persons have been resuscitated after this time. When breathing is established, give hot milk or coffee.

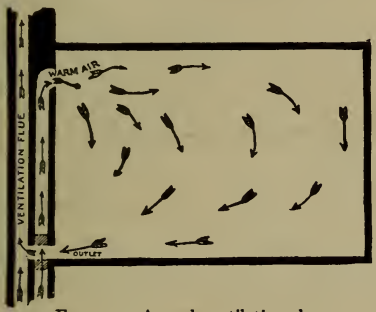


FIG. 71.— A good ventilation plan.

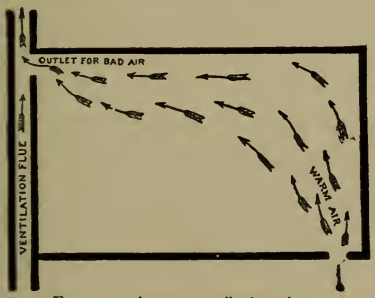


FIG. 72.— A poor ventilation plan.

Ventilation consists in the continuous replacing of the impure air of a room with pure fresh air. Fresh air is needed when the air of a room smells "stuffy" to a person coming into it from the outside. It is the presence in the air of carbon diox-

ide, and not the lack of oxygen, that makes it disagreeable for a person to breathe. In a room twenty feet square and ten feet high, one person will so contaminate the air that it will need to be renewed each hour, and yet the room may contain enough oxygen to last a week.

Natural Ventilation of a Room. — Cool air entering a room remains near the floor. As the air is warmed by breathing, it tends to rise toward the ceiling. If an opening be made near the ceiling, and another near the floor, the warm air will pass out of the upper opening and the cool, fresh air will enter the lower opening. The cracks about the windows and doors in a room, will generally furnish sufficient ventilation, but if the room contains many persons other openings must be made. People "catch cold" when any part of the body is chilled. In order to avoid a draft, the air in a room should not be completely changed oftener than three times an hour.

Modes of Ventilation. — The simplest way of ventilating a room is to lower a window from the top. The warm, impure air will then pass out at the top, while fresh air will enter between the two sashes. A modification of this method is to raise the lower sash a few inches and insert a narrow board in the opening in such a way as to leave a space between the sashes for fresh air to enter.

Forced Ventilation. — In large buildings such as factories, theaters, and schools, warm, fresh air is forced into the rooms by rotary fans. This air is often washed or purified before being sent through the pipes. The amount of moisture or humidity in the air can also be regulated. Cold air contains less moisture than warm air, and unless moisture is added

it is too dry, causing irritability of the nose and throat, hoarseness and liability to colds. When moisture is added to the air of the school-room, pupils are comfortable at a much lower temperature, brains are clearer, and results from lessons proportionately better.

Foul Air. — Expired air contains carbonic acid gas, watery vapor, and minute quantities of poisonous animal matter. If the air breathed contains more carbonic acid gas than is found in the blood, the carbonic acid in the blood is not given off, and the person soon becomes poisoned. The symptoms are drowsiness, shortness of breath, and unconsciousness, followed by death. Death, in such cases, is caused more by the lack of oxygen in the blood than by the actual presence of carbonic acid gas. Fortunately, however, discomfort is felt long before the oxygen is diminished to such a dangerous extent.

Crowd Poison. In a close, crowded room, there is soon noticeable a characteristic body odor. This odor is very disagreeable and oppressive, some persons being more susceptible to it than others. Its effects are drowsiness, headache, and nausea, until finally, Nature rebels entirely and a faint follows. There are many people who profess to be scrupulously clean, who keep their linen spotless and bathe frequently, who would not drink after another person nor use the same towel, comb, or tooth-brush, who nevertheless do not object to breathing the cast-off air from other lungs. Air once breathed is as impure, as decayed food and muddy water. Do not be afraid of open windows and fresh air. A draft only injures those wet with perspiration.

Night Air. The old idea that night air is unhealthful

is now known to be entirely false. No one can get too much night air, if he keeps warm enough. In cities especially, it may be said that night air is purer and better than day air, because at night there is less traffic on the streets to stir up dust and germs. Bedroom windows should be open wide all night, the bed being screened in cold weather. A direct wind should never strike the sleeper. Fresh air is the best preventive of colds and tuberculosis, it is the cure for both.

Carbon Monoxide. This gas is an active poison and is due to incomplete combustion of coal. It has a peculiarly, disagreeable odor, and may be smelled just after coal is added to a furnace or range if there is insufficient draft for good combustion. Care should be taken that the lids of the kitchen range are not left off at night; also that suf-

A MODEL CELLAR, SHOWING SEPARATE SECTIONS FOR FOOD STORES, LAUNDRY, FURNACE AND FUEL.

ficient draft is left on the heater to provide for good combustion.

Cellars. — The cellars and basements of houses are likely to be dark, close, and damp. Under such conditions, food quickly decays or becomes covered with mold. Disease germs thrive in such an atmosphere and are readily carried to the rooms above. Therefore all cellars should be kept dry, clean, well aired, and as light as possible.

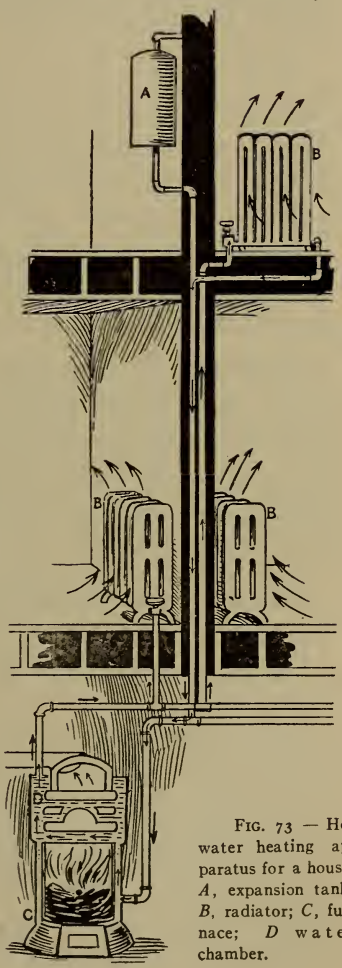


FIG. 73 — Hot water heating apparatus for a house. *A*, expansion tank; *B*, radiator; *C*, furnace; *D* water chamber.

Heating. — Most houses are heated by hot air from a stove or furnace. The objection to this method is the dryness of the air which dries out the skin and the mucous membrane of the mouth, nose, throat, and eyes. When dry heat is used, wide vessels of water should be set at the inlet — indeed, most heaters now have a receptacle for water. Hot air registers both heat and ventilate a room, if care be taken to admit fresh air to the pipes in the cellar. On a cold day the air inside

a house is so much warmer than outside that cold air rushes in, violently, and only a small opening is necessary. In summer, on the contrary, the air inside and outside being nearly of the same temperature, large openings are required to effect the change of air.

Heating with *steam* or *hot water* provides no means of introducing fresh air. The radiators, therefore, should be close to the windows so as to heat the air as it enters the room, and the outlet for air should be as far from the radiators as possible. The same rules apply to stoves.

Heating by *oil* and *gas stoves* is extremely bad, as they use up a large quantity of the oxygen in the room in an incredibly short time.

Fireplaces are hygienic, because there is a constant escape of air up the chimney, which air must be replaced from the outside, entering through every crack and opening, thus insuring good ventilation. There is nothing more inviting and cozy than an open fire-place full of blazing logs, or a cheerful coal fire.

Diseases of the Respiratory Tract. — *Rhinitis:* inflammation of the nasal passages, or common cold.

Coryza: a watery discharge flowing from the nose; a symptom of rhinitis.

Pharyngitis: inflammation of the pharynx, or sore throat.

Tonsilitis: inflammation of the tonsils.

Laryngitis: inflammation of the larynx — hoarse voice.

Bronchitis: inflammation of the bronchial tubes.

Pneumonitis or pneumonia: inflammation of the air-cells of the lungs.

Pleurisy: inflammation of the pleura or membrane cov-

ering the lungs; a very painful disease and one in which breathing is difficult.

Influenza or La Grippe: inflammation of the upper respiratory passages, attended with still graver constitutional disturbances.

Pulmonary tuberculosis: a growth due to the tubercle germs in the lung tissue. This germ forms little lumps of solid material, called tubercles, which finally join together till the whole lung becomes solidified and the patient dies from lack of oxygen. Tuberculosis is called the "great white plague"; it kills more people annually than almost all other diseases put together.

Catarrh: inflammation of any mucous membrane, but the term especially refers to the respiratory tract — inflammation, however, being a much better term.

Adenoids: spongy growths in the back of the nose. (See Hygiene of Digestive System, p. 67).

Diphtheria: a disease of the throat caused by a germ. A grayish-white membrane grows over the throat and tonsils, sometimes extending down into the larynx, in which case the patient chokes to death.

Colds.— A cold is inflammation of a mucous membrane.

Colds attack the body, only when the resisting power is low,— a condition brought about by loss of sleep, great fatigue, breathing bad air at a place of entertainment, etc. Hence the crop of colds that follows the gayeties of holiday weeks. Colds are caused by:—

1. Overheating of the body, followed by sudden cooling, especially in unexpected changes in the weather, and in

certain occupations involving alternate high temperature and sudden exposure to a lower.

2. Breathing air charged with irritating dust or vapor.

3. A cold, damp climate, or weather involving a series of damp, cold days.

After overheating and exposure to cold there is a sudden contraction of the skin, which squeezes the blood away from the skin back to the internal organs, causing the latter to become congested. Especially is this true of all the mucous membranes. At first there is a hot, dry, full feeling in the head, and the nose is stopped up — a condition due to the swelling of the mucous membrane, followed in a day or two by a profuse mucous discharge. This mucus kills the germs, if there are not too many. A cold usually runs its course in seven days. Repeated colds cause chronic inflammation.

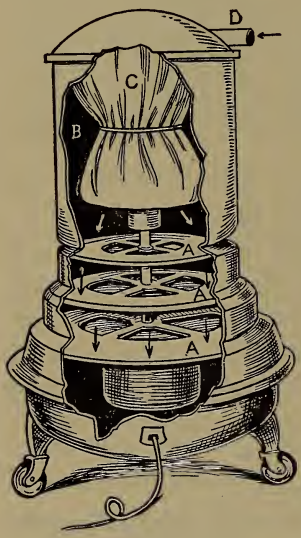


FIG. 74. — The principle of the Vacuum Sweeper. The revolving fan *A* forces the air downwards, causing a vacuum at *B*. The dust entering at *D* is caught in the bag *C*.

Treatment in the Early Stages. — Increase the circulation by means of vigorous exercise, such as a brisk walk or some gymnasium work, followed by a vigorous rub with a coarse towel. In the later stages:

1. Take a hot mustard foot-bath.
2. Take hot drinks such as milk, soup or lemonade.

3. Take a purgative, or medicine to move the bowels. The best purgatives are castor oil, cascara, magnesia, and phosphate of soda.

4. Go to bed at once and keep warm, staying there the next day, at least.

After the cold becomes fixed, however, it must run its course. In order to get well as quickly as possible, one should eat very moderately of food easy to digest; avoid hard work; especially avoid patent remedies for colds advertised in the newspapers, as many of them contain large amounts of opium or cocaine; finally avoid taking your friends' remedies! The handkerchiefs used during a cold should be kept in a separate bag and then washed and boiled separately to prevent distributing the germs, thus infecting the rest of the family.

Prevention of Colds.— 1. Encourage a free, vigorous circulation. The latter is deranged by overheating, as well as by chilling. A cool sponge bath every morning, or sponging the face, neck, chest, and arms with cold water will accustom the skin to cold.

2. Breathe pure air. See that all bed-rooms are well ventilated, with no strong draft blowing directly across the bed. See that the heated air in the home is not too dry, for dry air is irritating to the mucous membrane.

3. Avoid sudden cooling of the body after overheating, especially in dancing, walking, etc.

4. Wear the proper kind of underclothes. Cotton underclothes are not so warm as wool, but dry quickly. Woolen underclothes are warmer, but dry slowly. Knitted cotton underclothes are best for school girls and boys.

Woolen ones may be worn by delicate little children and old people.

5. Always breathe through the nose.. The blood vessels in the nose heat the air; the hairs strain out dust and germs; breathing is necessarily slower and the lungs are expanded a longer time. In mouth-breathers the mucous membrane becomes dry, bringing on chronic inflammation, hoarseness, and indigestion.

Dust. — The weakening effect of ordinary dust is one of the chief causes of lung diseases. In towns and cities the

WRONG METHOD OF STREET CLEANING.
(*Proper street cleaning requires strong, able-bodied men, and something better than the antiquated broom.*)

dust comes from the street. It consists of dirt swept from houses and stores, ashes, soot, dried horse manure, dried sputum coughed up by tubercular patients, and the germs of all kinds of disease. Constant breathing of dust causes colds and chronic inflammation of the respiratory passages — a condition common among coal-miners, marble-cutters,

workers in cotton waste, plasterers, glass cutters, carpet-cleaners, street-sweepers, workers in factories and cement works. Such a condition prepares the way for tuberculosis by gradually weakening the vitality of the lungs.

Rooms are best cleaned by the vacuum cleaner because, with this machine, the dust is sucked into a tube and car-

HYGIENIC METHOD OF SWEEPING A ROOM.

ried out of the house. Next to this method is the carpet-sweeper and, last of all, the broom. Carpets and lace curtains, pictures, and bric-a-brac are great dust collectors. Bare floors with movable rugs should take the place of carpets, and curtains should be frequently washed. A *household incinerator* is an admirable means of destroying waste, the accumulation of which is thus prevented.

Windows should be wide open during sweeping which, if possible, should be done on a windy day. The windows should be left open at least a half hour after sweeping, so that the dust may be blown out.

Dusting should always be done with a damp cloth, never with a feather duster, for the latter simply stirs up the dust and allows it to settle in another place. Dust should

IMPROVED MODERN METHOD OF STREET CLEANING.
(Note that the one machine sprinkles, sweeps and gathers up refuse.)

be collected in the cloth which, when full, can be vigorously shaken out of doors. Dusters should be washed after using.

Spitting should be forbidden everywhere, either indoors or on the street, for the sputum contains many germs which may be breathed in again as "live" dust. All streets before being swept should be sprinkled with water to prevent the dust from rising.

Consumption

Is chiefly caused by the Filthy Habit of

SPITTING

TAKE .THIS CARD HOME

And show it to your family, friends, and neighbors.

Consumption is a disease of the lungs, which is taken from others, and is not simply caused by colds, although a cold may make it easier to take the disease.

The matter coughed up and sneezed out by consumptives is full of living germs or "tubercle bacilli" too small to be seen. These germs are the cause of consumption, and when they are breathed into the lungs they set up the disease.

DON'T GET CONSUMPTION YOURSELF

Keep as well as possible, for the healthier your body, the harder for the germs of consumption to gain a foothold. Every person should observe the following rules:

DON'T live, study, or sleep in rooms where there is no fresh air. Fresh air and sunlight kill the consumption germs and other germs causing other diseases; therefore, have as much of both in your room as possible.

DON'T live in dusty air; keep rooms clean; get rid of dust by cleaning with damp cloths and mops. DON'T sweep with a dry broom.

KEEP one window partly open in your bedroom at night, and air the room two or three times a day.

DON'T eat with soiled hands. Wash them first.

DON'T put hands or pencils into the mouth, or any candy or chewing gum other persons have used.

DON'T keep soiled handkerchiefs in your pockets.

TAKE a warm bath at least once a week.

DON'T neglect a cold or a cough, but go to a doctor or dispensary.

TYPE OF CARD DISTRIBUTED BROADCAST IN NEW YORK CITY DURING A CAMPAIGN AGAINST TUBERCULOSIS BY THE BOARD OF HEALTH.

HOW TO GET WELL IF YOU HAVE CONSUMPTION

If you or anyone of your family have consumption, you must obey the following rules if you wish to get well:

DON'T waste your money on patent medicines or advertised cures for consumption, but go to a doctor or dispensary (see last page). If you go in time, you can be cured; if you wait, it may be too late.

DON'T drink whiskey or other forms of liquor.

DON'T sleep in the same bed with anyone else, and, if possible, not in the same room.

Good food, fresh air, and rest are the best cures. Keep out in the fresh air and sunlight as much as possible.

KEEP your windows open winter and summer, day and night.

IF properly wrapped up you will not catch cold.

GO to a sanatorium while you can and before it is too late.

The careful and clean consumptive is not dangerous to those with whom he lives and works.

DON'T GIVE CONSUMPTION TO OTHERS.

Many grown people and children have consumption without knowing it, and can give it to others. Therefore, every person, even if healthy, should observe the following rules:

DON'T SPIT on the sidewalks, playgrounds, or on the floors or hallways of your home or school. It spreads disease, and is dangerous, indecent, and unlawful.

WHEN YOU MUST SPIT, spit in the gutters or into a spittoon half-filled with water.

DON'T COUGH OR SNEEZE without holding a handkerchief or your hand over your mouth or nose.

REVERSE SIDE OF CARD ON PAGE 131.

VIII.—THE NERVOUS SYSTEM.

PHYSIOLOGY OF THE NERVOUS SYSTEM

The Nervous System. — The nervous system includes the brain and spinal cord, the nerves, extending from the brain and cord to all parts of the body, and the sympathetic nerves, which supply chiefly the organs in the body cavity and the involuntary muscles.

The Brain. — The brain fills the skull. It consists of three parts: the *cerebrum*, which is the largest part, the *cerebellum*, and the *medulla oblongata*. It is covered with three membranes. The outer, or *dura*, is tough and strong; the other two, the *arachnoid* and *pia mater*, are delicate, the latter car-

FIG. 75 The Cerebro-Spinal Nervous System

rying blood vessels to nourish the brain. The surface of the brain is folded into ridges and hollows, called convolutions and fissures. In a cross-section, the outer layer appears gray and thin; the inner mass, white. The whole is of a jelly-like consistency. The microscope reveals the composition of the brain as nerve cells and nerve fibers.

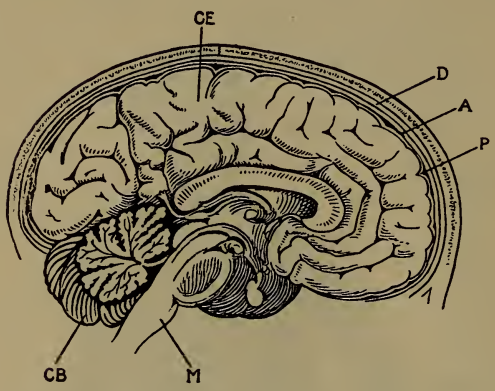


FIG. 76. — Cross Section of head showing coverings of Brain.

The cerebrum is divided into two hemispheres, each half being subdivided again and again. The cerebellum lies under the back part of the cerebrum. It is smaller and ridged with deep, regular fissures. It is connected by nerve bands with the cerebrum and medulla. The medulla is a stem or bulb joining the spinal cord with the brain.

Nerves are long, white cords of nerve matter, which run from the base of the brain, and from the medulla and spinal cord, to all parts. *Motor* nerves carry movement orders *from* the brain and cord to all parts of the body. *Sensory* nerves carry messages or stimuli from the parts *to*

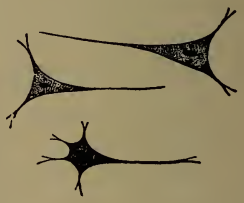


FIG. 77. — Nerve Cells of the Gray Matter of the Brain.

the brain. Twelve pairs of cranial nerves lead out from the base of the brain; thirty-one pairs of spinal nerves lead out from the spinal cord. The largest nerve in the arm is the median; the largest nerve in the leg is the sciatic.

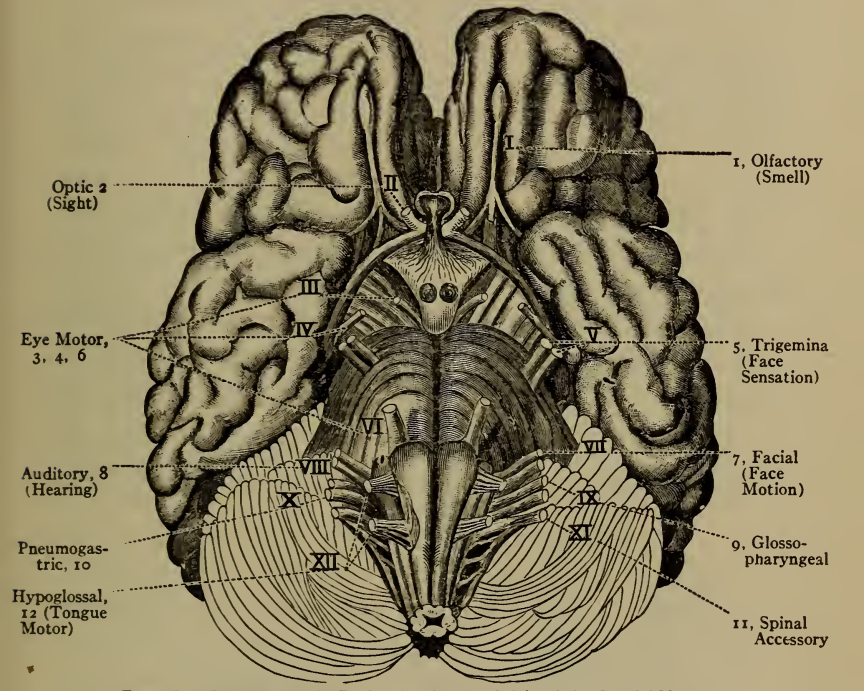


FIG. 78. — The Base of the Brain, showing the Origin of the Cranial Nerves.

The special sense organs as well as other parts of the body are supplied by the cranial nerves. The first pair of these nerves, the *olfactory* nerves, supply the nose; the second, or *optic* nerves the eyes. The third, fourth, and sixth pairs, called the *eye motor* nerves, are also concerned with the eyes and control the muscles of the eyeballs.

The fifth pair supply sensation or feeling in the face muscles; the fifth pair also send out branches to the teeth, and are the nerves affected in facial neuralgia. This fifth pair of nerves has also a branch running to the fore part of the tongue and giving the sense of taste; hence it is called the *gustatory* nerve. The seventh pair control the muscles and hence the expression of the face. The eighth pair, or *auditory* nerves, supply the ear; the ninth (the *glosso-pharyngeal*) and the twelfth (*hypo-glossal*) supply the muscles of the tongue. The tenth pair, passing downward from the brain cavity and giving off branches to the pharynx and larynx, are distributed to the heart, lungs and stomach and are hence called *pneumogastric*. The eleventh pair are accessory spinal nerves and supply certain muscles of the neck, back and shoulders. Nerves of touch are found all over the body.

The Spinal Cord is part of the brain substance. It leaves the skull through an opening at the back and extends down

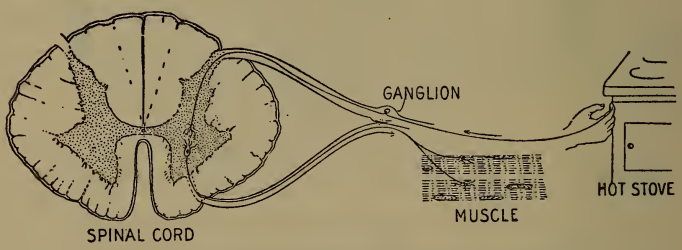


FIG. 79.—Diagram illustrating Reflex Action of an External Organ.

the spinal canal inside the backbone or vertebræ. The spinal cord is one inch in diameter and it gives off nerves laterally to the trunk, arms, and legs. It is

surrounded by the same kind of membrane as the brain. On cross-section, the outside is white, the inside gray, the gray matter appearing in the form of the letter H. Motor nerves connect with the front horns of the H and sensory nerves with the horns in the back.

The Sympathetic System connects the internal organs with the central nervous system and supplies glands and involuntary muscles. There are two main lines of nerves down each side of the spinal cord, and a network surrounds every organ and gland.

The sympathetic system is not under the control of the will. Blushing is an example of reflex action on the nerves controlling small capillaries of the face.

Functions of Brain and Cord. —The cerebrum is the seat of consciousness,

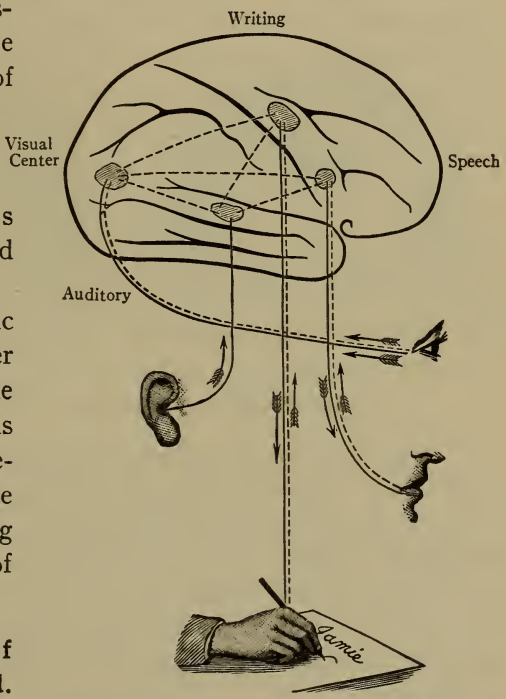


FIG. 80.—Connection of Brain Centers by Association Fibres. (*After Landois and Stirling.*) The dotted lines from the hand, mouth, and eye represent sensory fibers from the skin, muscles, and joints of the hand, lips, orbit, etc.

thought, will, intellect, and the control of voluntary action.

The cerebellum coördinates the muscular movements, making them work in harmony. Perfect muscular coördination is required in walking, talking, standing, swimming, etc. A drunken man staggers because the cerebellum is affected by alcohol thus causing a lack of coördination.

The medulla controls the vital functions. The centres which control the beating of the heart, respiration, circulation, swallowing, vomiting, etc., are all located here. The cord transmits messages to and from the brain and controls *reflex action*, that is, action that takes place without the control of the will. (*Fig. 79, p. 136.*)

The sympathetic system attends to the working of all the internal organs; it presides over such involuntary processes as digestion, peristalsis or movement in the intestines, the regulation of the heart-beats, the secretion of sweat, and the contraction of the eyes in a strong light.

HYGIENE OF THE NERVOUS SYSTEM

A clear brain and sound nerves require plenty of good, pure blood. Nearly one-fifth of the blood in the body goes to the brain. Pure blood depends upon fresh air, good food and sleep. Plenty of sleep is necessary to renew depleted nerve cells. After being used, the cells become thin and full of poisonous fatigue products which must be carried away by the blood and expelled from the body.

Habit. — By doing the same thing again and again, the same nerve cells are called into action, until at length they act entirely independent of the will. This independent

action of the nerve cells is called a *habit*. Habits may be good or bad. The habits of the child determine the character of the man or woman.

Cultivate a pleasant expression, politeness in speech and manners, the habit of concentration on the matter in hand — an invaluable habit to all students — the habit of eating slowly and chewing the food thoroughly. Cultivate good thoughts; evil thoughts leave an indelible impress on the face.

EFFECT OF HABIT ON THE FACE AS FAR AS EXPRESSION IS CONCERNED.

Read good books. Form the habit of retiring early and rising immediately on being called. The habits formed in the growing period are the strongest, and will largely determine the character of the boy and girl in after life.

The brain requires exercise to make it grow, just as a muscle needs exercise. Thinking brings more blood to the brain and thus more nourishment to the cells, making them grow faster. Studying or thinking exercises the brain.

The brain grows fast in youth; later it develops very slowly. It is therefore of the greatest importance that the period of youth be devoted to education. Young people who leave school early and try to study again in later years find the task much more difficult; they seem to have lost the ability to study.

The cause of many nervous breakdowns is excessive or too long sustained use of the nervous system. In many cases, however, it is not because the brain and cord have been overworked, but because the muscular system has been weakened by neglecting to take sufficient exercise, and, as a consequence, has failed to minister to the rest of the body. Worry injures the nervous system even more than overwork or lack of exercise.

Fatigue may be muscular, mental or emotional, and is due to toxins or poisons in the blood. These toxins are one of the results of cell activity of any kind in the body. The toxins formed by the activity of brain and nerve cells are much more poisonous than those formed by muscle cells; therefore the brain worker becomes tired sooner that the day-laborer. Most of these poisons are burnt up while we sleep, while others are removed by the excretory organs. Whenever the body is rid of the toxins we feel refreshed.

Hard work causes an accumulation in the tissues of carbonic acid gas, which is Nature's narcotic. The drowsy and dull feeling is a sign that enough work has been done and that the person should rest. Such drowsiness is pleasant. An entirely different kind of fatigue occurs in the person who does not work. Through lack of exercise the

poisons in the tissues of such a person are not burned up or oxidized, and he thus poisons himself. Such a condition is accompanied by extreme irritability.

Rest may be secured in two ways: by sleep, and by change of occupation. During waking hours, destructive changes occur in the body; during sleep, constructive changes take place.

Amount of Sleep Necessary.— Babies require from sixteen to eighteen hours of sleep; very young babies, twenty; school children, nine to ten; and adults, seven to nine. Some persons require less sleep than others; for instance, it is reported that Thomas Edison requires but three or four hours. This, however, if true, is an exception to the rule, and may be explained by the fact that some persons recuperate more quickly than others.

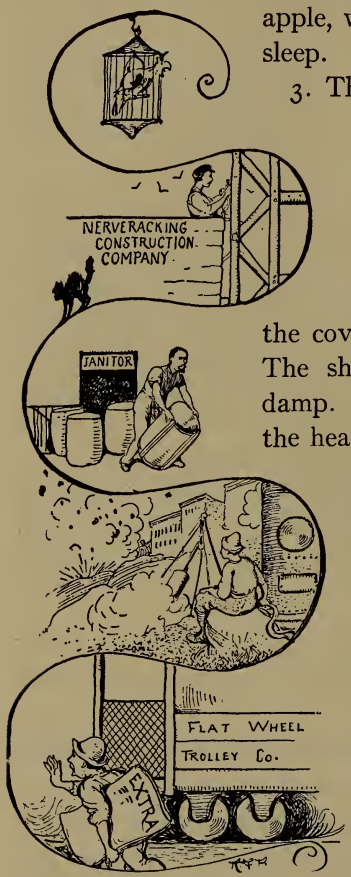
As one grows older, much less sleep suffices. Invalids really sleep more than they imagine. A person might "hear the clock strike every hour" — and yet sleep between strikes all the time!

Conditions Favorable to Sleep. — One hour's sleep under favorable conditions may be worth a whole night's sleep otherwise.

1. To sleep well one must be muscularly tired. Healthy fatigue comes from hard work; there is an accumulation of waste products in the blood and the resulting drowsiness is pleasant. Fatigue without work comes to idle people. In such cases there is a lack of exercise, oxidization of the blood is incomplete, and fatigue results from the waste products in the blood.

2. There must be no *constipation* or *indigestion*. Diges-

tion should go on quietly during sleep. One should never go to bed hungry; a cup of hot milk and a biscuit, or an apple, will relieve hunger and promote sleep.



SOME NOISES WHICH TEND TO INCREASE NERVOUSNESS.

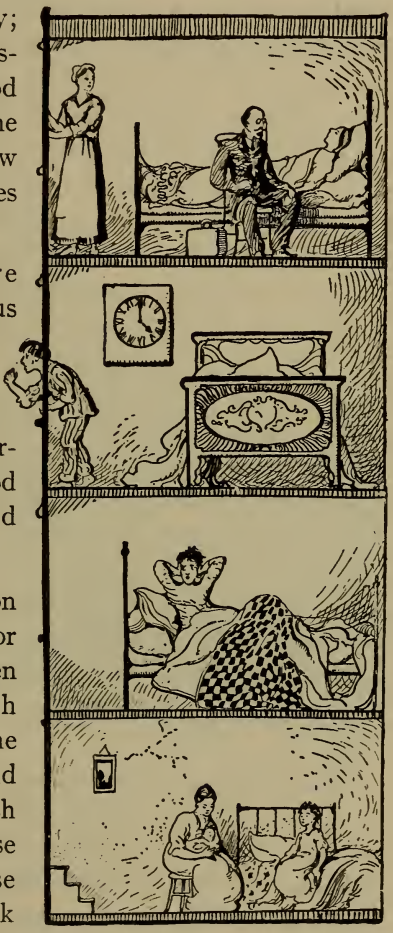
3. There should be *good ventilation* in all sleeping rooms. The room should be quiet and dark. Darkness rests the eye, quietness rests the ear, and sound, restful sleep is the result. A low pillow should be used, and the covers should be light but warm. The sheets should never be cold or damp. The feet should be warm and the head cool. Feather-beds are bad; they are hot and moist, and lacking in ventilation. Before closing the eyes one should look quietly toward the ceiling, relax all the face muscles to prevent wrinkles; then relax all the muscles in the body; breathe deeply and evenly. Sleep on the back or inclined a little toward one side. Keep still, and sleep will come quickly.

4. There should be *no excitement* just before retiring. All study should be stopped for at least a half hour, and some pleasant recreation indulged in; such as music, a quiet game, or a short walk.

During sleep the breathing is slower and fainter; the heart beats more slowly; less heat is produced; digestion is slower and less blood is sent to the brain. The vitality of the body is low and the condition simulates death.

Dreams. — Dreams are usually records of previous experiences. The ideas are confused, as the will and judgment are not present to adjust and arrange them properly. Good dreams are restful; bad dreams are disturbing.

Rising.—Always get up on waking or being called, or the instinct to awake when you have had enough sleep will be lost. Some people sleep too much and become drowsy or sluggish in their minds. Do not use an alarm clock, as the noise is a great nervous shock which may be injurious.



HOW CITY NOISES DISTURB REST.

Drugs which Induce Sleep. — Some drugs, called somnifacients, are used to induce sleep. This condition

however, is not real sleep; it is unconsciousness. The body is neither built up nor refreshed. Opium, chloral, and the bromides deaden pain and produce sleep, but they do so at the expense of the nervous system, the nerves of which they deaden. Such drugs should never be taken except by direction of a physician.

Abnormal sleepiness is a symptom of such diseases as anæmia, liver and kidney disease, constipation and indigestion. A physician should always be consulted.

To prevent sleep, do not sit too near a hot stove; do not wear too warm clothing in the house; do not sit in a badly ventilated room; do not sit in a rocking-chair; do not lean over a table to study; do not eat rich, heavy food. *Nervousness* and *worry* always hinder sleep. Nervous people usually have sluggish minds and irritable tempers; they are likely to have either hilarious spirits or "the blues." They cannot keep still and their condition shows itself in nervous twitchings, fidgeting, or more violent movements, called chorea or St. Vitus' Dance. City children are often nervous and self-conscious because they hear too much noise, get too little sleep, eat too many sweet things, meet too many people and have no chance to be alone and rest.

Nervousness. — Too many school children are nervous or have weakened control of the nerves. In cities the causes producing weakened nerves in children are legion; chief among them being the constant street noises, loss of sleep, too frequent attendance at places of amusement, improper food including a too free indulgence in candy, ice-cream, cake, and soda-water, and a lack of pure, fresh air.

All schools should provide good ventilation, as breathing bad air does more harm to the young students than overstudy. The home preparation of school work should not exceed more than two or three hours. Play and games

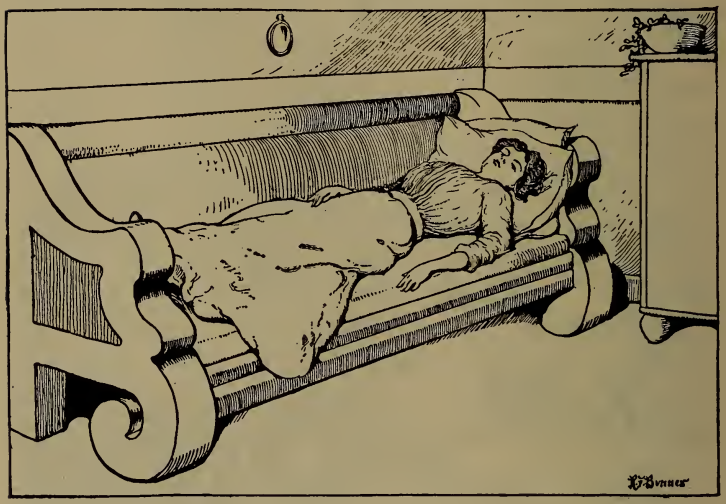
TIRED CHILDREN RETURNING FROM A POPULAR OUTING.
(Note that every condition seems to be present for indigestion and sleeplessness.)

should be encouraged outside of school in the afternoons. Between lessons, breathing and stretching exercises should be provided.

Rules for the Nervous Person. — Forget yourself and think of other people. Do not hurry. Be calm and quiet. Stop all work at intervals and think. Take deep breaths,

as it relaxes tension. Do not worry. Keep control of yourself and your actions. Be bright, cheerful, and happy, even if you feel quite the opposite. Smile and look cheerful, and you will become cheerful.

During the lunch hour in school, stop thinking of work and lessons. Change your occupation. If you have been sitting, walk; if you have been on your feet, rest. Laugh



RESTING THE MUSCLES BY COMPLETE RELAXATION.

and talk and tell your best stories, thus improving the digestion and the nervous system at the same time. All school boys and girls should have a hobby and ride it hard. This gives rest and relaxation to the strained nerves. Limit your attendance at parties and other dissipations to the end of the week. If possible spend Saturday and Sunday in the country. Try to be entirely alone for at least an hour every day.

When the body is tired, lie down for a half hour or an hour in the afternoon; loosen the clothing, relax and sleep. Nature will be grateful and will show her gratitude in supplying new energy to accomplish new tasks.

Relaxation. — The ability to relax is one of the most valuable gifts of Nature. The entire body should be relaxed in order to sleep and rest properly. Therefore the person who relaxes most quickly, goes to sleep most readily. The ability to relax seems to come naturally to some people, though it may be acquired by everybody. The habit of momentary relaxation in the midst of hard work is of great value to the individual.

How to practise relaxation. On going to bed let the body go, absolutely; do not try to hold up the bed. Lift first one arm over the head, then the other; then drop them both as if they were dead. Do the same with the legs alternately, then with the head and neck. Contract the muscles in order to realize how hard they feel; then let them go loosely, without changing the position of the limb. By practice complete relaxation may be acquired in a few seconds, and rest and sleep will surely follow.

THE SENSES

General Sensation. — Sensation is either general or special. General sensations indicate the condition of the interior of the body. They are conveyed usually by many sympathetic nerves all over the body. These sensations, however, are not always exact. Examples of general sensations are hunger and thirst, pain, nausea, itching, restlessness, giddiness, and faintness. We are often only partly

conscious of these sensations and are unable to locate them exactly.

General sensations are an invaluable guide to health. They are warning signals which should always be obeyed. Fatigue of body or mind means that the work causing it should stop. Thirst should be quenched with cool water; hunger should be appeased with food and, when hunger is satisfied, eating should cease. Pain should always be investigated, and not merely deadened with opiates and narcotics, which relieve the pain but leave the original cause of the pain untouched. When sleepy one should go to bed and, on waking in the morning, get up promptly.

Headache.— This is the most common and the most useful pain, as it is a danger signal indicating trouble somewhere in the body. Whatever the remote cause may be, certain poisons called toxins are produced, which circulate in the blood through all parts of the body. On reaching the delicate nerves of the head, face and scalp, they cause pain. Though the toxins influence all parts of the body, they produce their greatest effect where the nerves are the most sensitive.

There are two kinds of headache, the *congestive* and the *anæmic*. The congestive headache produces a flushed face, reddened eyes and a bursting feeling in the head. The anæmic headache is accompanied by a cool, moist skin, extreme pallor, nausea and vomiting.

Remote Causes of Headache. — Headache may result from any one of the following causes: Indigestion, especially from tainted food, such as too old meat, stale shellfish or sour ice-cream; badly ventilated rooms; too much sun; broken sleep; bad news; worry; overwork; a cold; eye

strain; constipation; lack of exercise; the beginning of infectious fevers, etc. All headaches are accompanied by fatigue, which may be either muscular, mental or emotional.

Muscular fatigue may result from house-cleaning or a hard game of basket-ball; mental fatigue from over-study or continuous reading; emotional fatigue from excitement on Commencement Day, or from indulgence in anger, grief or homesickness.

Fatigue products from the nerve cells called into play by brainwork are more poisonous than those from the muscle cells; therefore mental work is more tiring than manual labor.

Ptomaine poisoning is the result of eating tainted food. The headache is severe and is due to the poisons liberated by the putrefaction of food in the stomach.

Sick headache has nothing to do with the stomach. The vomiting is merely sympathetic due to the extreme pain in the head. Vomiting in sea-sickness is also sympathetic, being due to dizziness and disturbance of the semi-circular canals in the inner ear.

Bad ventilation causes headache. The carbonic acid gas cast off by the body, is breathed in again and the body becomes poisoned by it.

Constipation prevents the proper evacuation of the bowels so that waste products in the intestine are re-absorbed into the blood and the body is poisoned.

Loss of sleep prevents the burning up of the fatigue products made during the day, which products remain in the tissues and poison the body. If these poisons accumulate, they will cause wakefulness or insomnia.

Nasal obstruction due to adenoids and chronic inflam-

mation of the nose and throat interferes with breathing and therefore with the purification of the blood.

Treatment of Headache. — The remote cause should be found and treated. Temporary relief will be found in rest and gentle massage. *Rest* means lying down in a darkened room, with the eyes shut, the body absolutely quiet and all the muscles relaxed.

REST ROOM FOR EMPLOYEES IN A MODERN FACTORY.
(A case of bad headache.)

For the congestive headache, apply cold water to the head; for the anæmic headache use hot water. This will tend to equalize the blood supply. The application of massage, or gentle friction, to the head, by soothing the nerve endings in the scalp, will also help to relieve the headache.

Great care should be exercised in taking remedies for

headache. Patent headache medicines are harmful, as they contain *acetanilid*, a drug which injures the heart permanently. Remedies which relieve pain, without removing the real cause, make the condition worse. The nerves are only deadened and the poisons remain in the blood just the same. The sensibilities of the patient are blunted — the judgment, will, and keenness of perception are dulled. When it is necessary, the doctor will always give a mild nerve sedative which will not injure the patient.

Special Sensation. — The special senses tell us what is going on in the outside world. Each special sense has a special organ on the surface of the body. The spinal and cranial nerves also act as special sense nerves.

The special senses are touch (including sense of pain, temperature, pressure, and the muscular or *kinæsthetic* sense), taste, smell, hearing, and sight.

Touch or the Tactile Sense. — The nerves of touch are in the skin and end in touch corpuscles in the dermis. The delicacy of touch varies in different parts of the body, being greatest on the tip of the tongue, the lips, and the ends of the fingers.

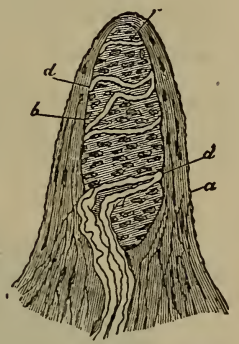


FIG. 81.—A Touch Corpuscle.

The temperature sense is the ability to recognize heat and cold. The thermic nerves, as they are called, are easily tired; for instance, in putting the hands in a basin of hot water, the sensation of heat is soon dispelled, while in cold countries the nose may be frozen without one's being conscious of it.

The pressure nerves are around the roots of the hairs. A hair cannot be disturbed without one's being conscious of pressure, however slight. Pressure is felt first on the forehead and temples.

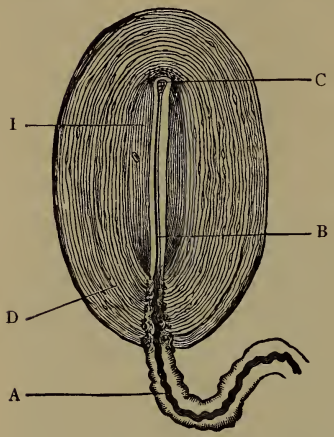


FIG. 82. — Pacinian Corpuscle, magnified. *A*. Medullated nerve fiber; *B*. Axis cylinder terminating in small bulb at *C*. *D*. Concentric layers of tissue. *E*. Inner bulb.

The sense of pain has special nerves distributed all over the body. Pain is always a danger signal to let us know that something is out of order. These nerves may be deadened internally by narcotics, or locally by freezing, or by applications of certain anæsthetic drugs such as cocaine, etc.

The muscular sense gives one the sense of weight in a given object. While holding an object, an increase of one-seventeenth of its weight can be felt.

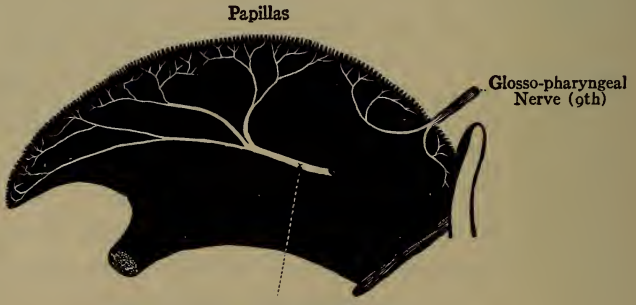


FIG. 83.—Nerves and Papillas of the Tongue.

Taste. — The organs of taste are located in the papillas of the tongue, the soft palate, and the throat. The nerves of taste are the glosso-pharyngeal and hypoglossal. The papillas make the tongue look rough. Those appearing on the tip and top of the tongue, as white or red dots, are the fungiform papillas. By means of the papillas at the tip we taste sweet things and by means of those on the sides

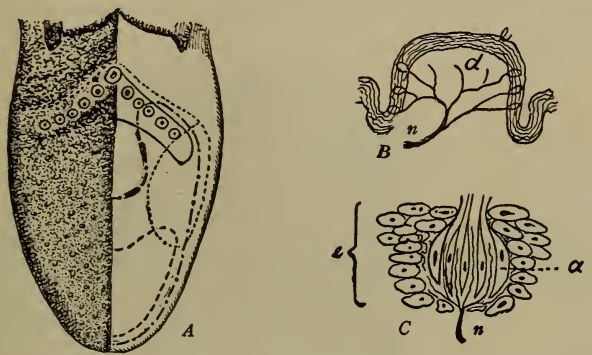


FIG. 84. — SENSE ORGANS OF TASTE. *A*, map of upper surface of tongue, showing on the left the different kinds of papillas, and on the right the areas of taste (after Hall). Area sensitive to bitter (———); to acid (.....); to salt (—.—.—.—); to sweet (— — — — —). *B*, section through a papilla; *n*, small nerve connecting with taste buds at *d*; *e*, epithelium. *C*, single taste bud magnified: *n*, nerve, the fibers of which terminate between the spindle-shaped cells *a*; *e*, epithelial cells.

of the tongue, sour and salty things. Far back on the tongue are about a dozen large, circumvallate papillas, which enable us to taste bitter things.

Any substance to be thoroughly tasted must be in liquid form or dissolved in a liquid. Food should therefore be thoroughly chewed and mixed with saliva, in order to be thoroughly *tasted* and enjoyed.

Smell. — The sense organs of smell are located in the mucous membrane which lines the upper cavity of the nose.

In ordinary breathing, air does not reach this part of the nose, so when we wish to smell things better we naturally sniff the air. The nerves of smell are the olfactory nerves Matter must be in the form of a gas in order to be thoroughly smelled. The sense of smell is very delicate and keen and is more effective in recalling to the mind early associations than any other sense.

Taste and smell are closely related. This fact is proved

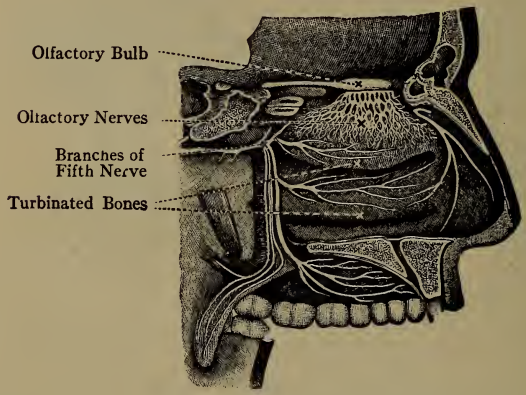


FIG. 85.—Nerves of the Outer Wall of the Nasal Cavity.

by the loss of taste when one is suffering from a cold. Such articles as coffee, onions, peppermint, etc., are more smelled than tasted. Often very repulsive medicine may easily be swallowed by holding the nose and thus avoiding the smell. During a cold in the head the mucous lining of the nose is thickened, there is an increase of mucus, and both the senses of smell and taste are obscured.

With chronic inflammation, or adenoids, there is a lack of perception of flavors and odors; consequently, food tastes

insipid, unless much salt, vinegar, mustard, horseradish or other strong condiments are added. Besides injuring the stomach, these powerful condiments blunt the sense of taste to the milder flavors, such as that of butter unsalted, which tastes more of fine cream than when salted.

Food to be digested properly must be palatable and enjoyable. People who eat slowly enjoy the taste more and digest their food more easily. The nerves of taste and smell are easily tired The first whiff of cologne is always

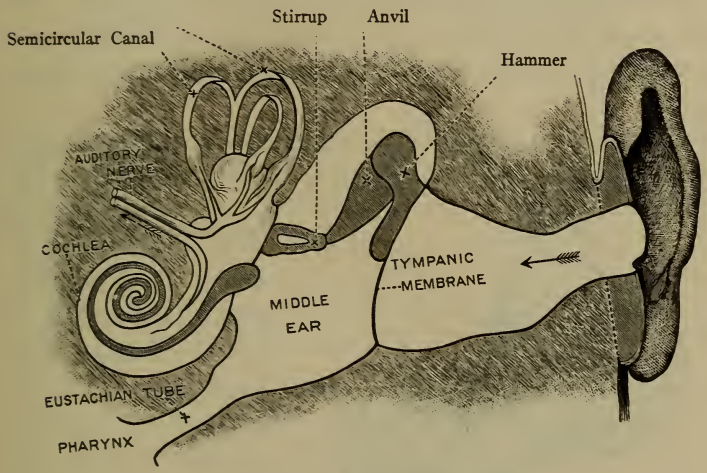


FIG. 86. — Structure of the Ear.

the best; the first taste of sweetbreads always the most distinctive.

Hearing. — The sense organ of hearing is the ear, of which there are three sections — the outer, middle and inner. The nerve of hearing is the auditory nerve.

The outer ear consists of the wrinkled cartilage which we

see, and the canal passing into the head through the temporal bone. This canal, called the external auditory canal, is closed at its inner end by a delicate membrane called the drum membrane. The skin lining the passage is supplied with small hairs and wax glands.

The middle ear or *drum* lies between the outer and inner ear. It is connected with the throat by the Eustachian tube, which admits air to the drum. This tube opens every time we swallow. Three small bones, called from their shape the malleus (or hammer), the incus (or anvil), and the stapes (or stirrup), form a chain across the middle ear from the drum membrane to an oval opening into the inner ear.

The inner ear, or labyrinth, is composed of three portions, the vestibule, the cochlea (snail shell), and three semicircular canals, all deep in the temporal bone. These cavities are filled with a watery fluid. The auditory nerve is spread out in the membrane lining the cochlea. The semicircular canals are concerned in keeping the equilibrium of the body.

FIG. 87. — General Form of Internal Ear. The illustration represents the structures of the internal ear surrounded by a thin layer of bone. 1, vestibule; 2, cochlea; 3, semicircular canals; 4, fenestra ovalis; 5, fenestra rotunda.

How Sound is Heard. — Sounds are produced by a disturbance in the air, which causes sound-waves to vibrate in every direction.

The waves of air enter the external auditory canal, strike against the drum membrane and cause it to vibrate. These vibrations put in motion the three small bones in the middle ear, which in turn transmit the vibration to the

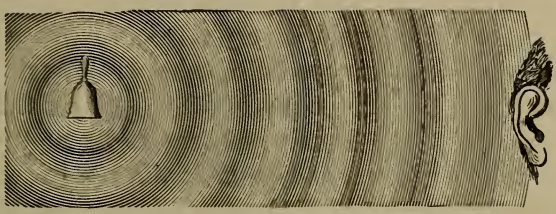


FIG. 88. — Diagram illustrating the Spreading of Sound Waves through the air.

fluid or lymph in the inner ear. The fluid strikes against the membranous lining of the cochlea and touches the nerve endings of the auditory nerve, which latter carries the impression to the brain.

Care of the Ears. — 1. Never box a child's ears, as the delicate drum membrane might be broken and deafness result.

2. When listening to any loud noise such as a salute of cannon, always open the mouth in order to allow plenty of air in the Eustachian tube to insure equal pressure on both sides of the drum membrane.

3. For insects in the ear, pour in warm oil to kill or paralyze the insect. Then gently syringe the ear with warm water. Never poke the ear with an instrument of any kind.

4. Let the wax in the ear alone. Remove only that which can be reached with a soft towel around the end of the finger.

Some drugs, such as quinine, cause a buzzing in the ears and temporary deafness; they should be avoided by any one having an hereditary tendency to deafness.

Earache is usually due to inflammation of the middle ear. In light cases, apply dry heat in the form of a hot-water bottle. If the pain is very severe, do not wait too long, but go to an ear-specialist, who will puncture the membrane and let out the pus which is causing the pain. Delay may cause the drum membrane to be ruptured, in which case a ragged scar and deafness will result.

Frequently infectious diseases, such as measles and scarlatina, are followed by deafness. Adenoids, which grow over the openings of the Eustachian tubes, also cause deafness.

The Sight. — The sense organ of sight is the eye. The eyeballs are globes, about one inch in diameter, situated

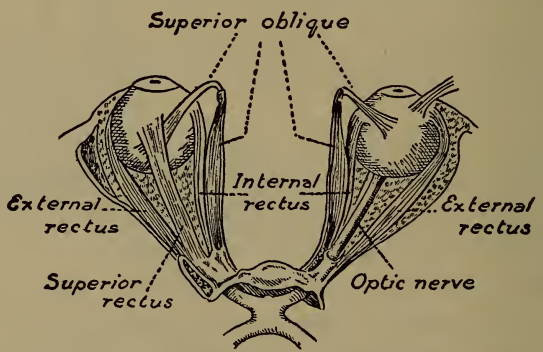


FIG. 89. — Exterior Muscles of Eyeball.

deep in bony sockets called the orbits. The eyes rest on cushions of fat. They are protected by the eyelids and lashes from light and dust; by the brows from perspira-

tion; by the tears from friction; and by the forehead and cheek bones from injuries. Six small muscles hold the eye in place and move them in various directions. Cross-eyes or squint is caused by the inner muscles pulling stronger than the outer muscles.

Tears are a salty fluid secreted by the tear glands under the upper eyelid, on the outer side of the eye. Tears lubricate and cleanse the eye, carrying dust and other particles of matter into the nose through the tear ducts, the openings of which may be seen on the inner corner of the lower eyelid, as small red spots. During a cold, the tear ducts may easily be stopped up, causing watery eyes. In the eyelids are small glands secreting an oily fluid, which prevents the tears from overflowing the lids. When this secretion is too abundant as during sleep, the lids stick together.

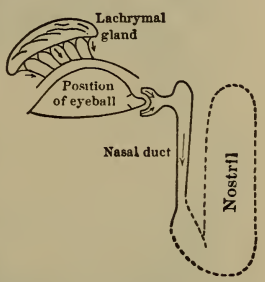


FIG. 90. — Diagram of Irrigating System of the Eye. After wetting the eyeball tears may pass into the nostrils and moisten the air entering the lungs.

The Eyeball. — The outer wall of the eyeball has three coats. The outer, or *sclera*, thick and white, is for protection; the front of the sclera is transparent and forms the *cornea*. The middle coat, or *choroid*, consists of black or brown pigment (for absorbing superfluous light), and many blood vessels. The front of the choroid forms the *iris*, or the ring which gives color to the eye. The choroid is pierced by a hole — the *pupil*. The inner coat or *retina* is very thin; it is of a pinkish color, and on it are spread out the end fibers of the *optic nerve* which is the *special*

nerve of sight, and which enters the back of the eyeball at the centre.

The interior of the eye is divided into two chambers. The front or *anterior chamber* is filled with a watery fluid called the *aqueous humor*. Just back of the iris and pupil, between the front and back chambers, is a solid, clear little body called the *crystalline lens* through which the rays of light pass on their way to the retina. The *posterior chamber*, which is larger than the anterior, is filled with a clear, jelly-like substance called the *vitreous humor*.

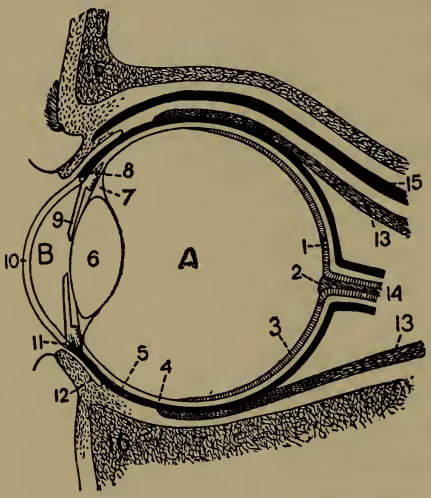


FIG. 91. — Diagram of the Eyeball in Position. 1, yellow spot; 2, blind spot; 3, retina, 4, choroid coat; 5, sclerotic coat; 6, crystalline lens; 7, suspensory ligament; 8, ciliary processes and ciliary muscle; 9, iris containing the pupil; 10, cornea; 11, lymph duct; 12, conjunctiva; 13, inferior and superior recti muscles; 14, optic nerve; 15, elevator muscle of eyelid; 16, bone. *A*, posterior chamber containing the vitreous humor. *B*, anterior chamber containing the aqueous humor.

Sight, like sound, is produced by the rapid vibration of a substance called ether. Ether is present everywhere, even where air does not exist. Waves of light always travel in straight lines, called rays. If a substance permits light to pass through it perfectly, it is said to be transparent; if partially only, translucent; if not at all, opaque.

How We See. — Rays of light enter the eye through the

cornea, passing through the aqueous humor and the pupil; the iris regulates the quantity of light by contracting or dilating as circumstances warrant. The crystalline lens in the normal eye causes the lines of light to converge, so that after passing through the vitreous humor they fall

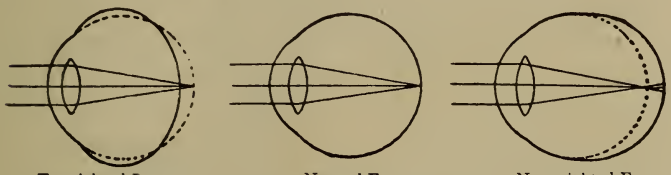


FIG. 92.—Defects in Eyesight.

upon the retina in just the proper way to form a tiny inverted image of the objects seen. The optic nerves from the two eyes cross in such a wonderful way that one of these images is super-imposed upon the other, thus causing us to see but one object, and that not inverted. The choroid or middle coat absorbs all superfluous light. *Albinos*, who, have no pigment in the iris and choroid and consequently, are always squinting to keep out the light, are able to see clearly only in a half-light.

In order to focus the light properly on the retina, the crystalline lens changes its shape according to whether the

SNELLEN'S TEST LETTERS.

(These should be seen distinctly by a correct eye at a distance of twenty feet.)

object looked at is near or distant. If the lens brings the rays of light to a focus before they reach the retina, we say the person is *near-sighted* and requires concave glasses.

This condition is often present in young people. If the rays are not brought to a focus soon enough, we say the person is *far-sighted*, and requires a convex lens. This

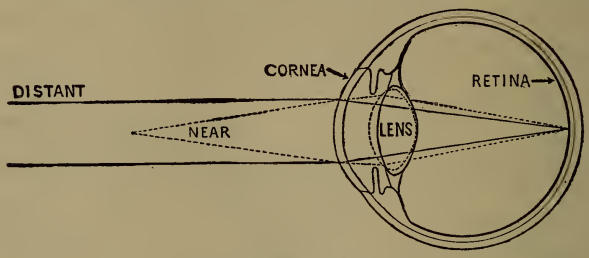


FIG. 93. — Diagram showing changes in shape of crystalline lens to adapt it to near and distant vision.

condition is common in old people. Our eyes at rest are naturally farsighted. It requires muscular action of the lens to see things closely; this action is called *accommodation*.

Astigmatism is a condition due to inequalities of the sur-

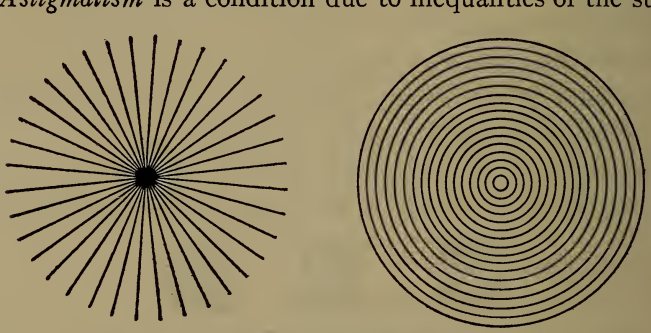


FIG. 94. — Test for Astigmatism. If some of the lines appear darker than others the eye is astigmatic.

face of the cornea or lens. Headaches, dizziness, smarting and watering of the eyes result from this condition. Proper glasses will remedy it.

Care of the Eyes. — 1. Eye strain may show itself by headaches, nervousness, nausea, and indigestion.

2. If the eyes need an examination, go to an oculist, not to an optician. An *oculist* is a regular physician who has made a special study of the eye and is perfectly competent to order lenses. An *optician* is a person who makes and sells eye-glasses. Such a person is not capable of prescribing glasses. This work should only be done by an oculist.

3. For reading, sewing, or any close work there should be a good steady light, neither too bright nor too dim. The light should be on the work, not on the eyes; it should come from behind, preferably over the left shoulder. Do not read while travelling in a train, street-car, or automobile, as the constant trembling and jerking is very hard on the eyes. Moving pictures are also injurious to the eyes for the same reason.

METHOD OF EXTRACTING CINDER OR OTHER FOREIGN BODY FROM THE EYE.

4. Never read lying down, as the eyes are then in a strained position and become congested with blood. Never read fine print.

5. Rest the eyes occasionally by closing them, or by looking at some distant object.

6. Avoid dust, as it is irritating and causes redness, watering, etc. To remove a cinder under the upper eyelid

have the person look down, then gently turn the eyelid up over a lead-pencil and remove the speck with the corner of a handkerchief. Bathe the eye in hot water to relieve congestion.

DOTTED VEILS ARE SPECIALLY INJURIOUS TO THE EYES.

7. Avoid dotted or thick-meshed veils, as they cause headache.

8. Never wipe the face with the towel of a public toilet-room or with another person's handkerchief, as many serious eye diseases have thus been communicated from one to another. In fact the public towel should be avoided.

9. For *sore eyes*, use a solution of boracic acid, a half teaspoonful to a cup of warm water. Wash the eye out with the solution, using an eye-dropper. Always consult a physician in case of any inflammation of the eyes.

CORRECT METHOD OF USING ANY EYE-DROPPER.

IX.— EXPERIMENTS.

Cells:

1. Observe frog's eggs — obtained in April—in jelly-like masses.

2. Observe transparent membrane inside the outer layer of an onion. Lay a piece in a drop of water on a glass. Look through it toward the light with an ordinary magnifying glass. Note the rectangular cells.

3. Microscope. Scrape a little material from the inside of your cheek. Note the flat epithelial cells.

Foods:

1. *Coagulation.* Let milk stand in a glass in a warm room for a few days, or pour in some vinegar or a tablet of rennet.

2. Pupils should cook eggs at home so that the white is soft and not tough.

3. *Mold.* Moisten bread and touch it to the floor. Place in a tightly covered dish in a warm room and observe the growth of mold.

4. Take a potato and cut in half. Stand each half in a cup containing a teaspoonful of water. Put in a room when sweeping. Then cover with a saucer and keep in a warm room for a week. Note growth of bacteria.

5. Fats and Oils. Place a little tallow on unglazed paper and warm. Hold paper to light and note that it is semi-transparent. Place a little starch, sugar, chalk or

white of egg on paper and reheat. Is the effect the same? Heat tallow in a spoon and compare effects of heat on proteid and fat.

6. Adulteration of food. Add boracic acid or formalin to milk; and note the peculiar taste. Add salicylic acid or borax to canned vegetables and note the taste.

Skin:

1. Let a pupil put his hand on the desk behind him and another pupil touch a hair on that hand with a pencil. The first pupil should speak the moment his hand is touched. (Evidence of increased sensitiveness).

2. *Perspiration.* Hold a piece of cold glass near the cheek, or place cheek near a cold window pane. Note the moisture.

3. *Moisten* your right hand and let it dry. Then touch the other hand. Did the right hand feel cold?

4. *Wet your hands.* Place them on cotton — linen — woolen — silk. Which is most absorbent? Which least?

5. Test looseness of weave in samples of different weaves by noting how far each can be stretched.

Digestive System:

1. Examine full set of teeth obtained from a dentist. Saw through a tooth and observe structure.

2. Observe teeth with a mirror. Note four kinds. What are they for? Are they clean? Any decayed spots? Do the canines project beyond the other teeth as in a dog? Do the upper and lower incisors meet when the jaws come together?

3. Look at the teeth of young children at home and note whether they are coming in straight or not.

4. Examine alimentary canal of a cat, squirrel, or rabbit. (Formalin 2 oz. to water 1 qt. for preserving specimens.)

5. Obtain a piece of stomach or intestine from a butcher. Note the coats of the stomach and the villuses of the intestine.

Digestion:

1. *Test for acids.* Blue litmus paper turns red. Test sour milk, vinegar, and lemon.

2. *Alkalies.* Test baking-soda in water. Red litmus paper turns blue in alkaline substances.

3. *Starch.* Starchy substances turn blue when tested with iodine.

Dilute tincture of iodine and test paper and cardboard. Make pastes with cornstarch, wheat flour, and white potatoes. Heat each and test with dilute iodine. Try rice in which the reaction is very blue.

4. *Test for grape sugar.* Place a piece of pear in a test tube. Add a little Fehling's Solution and boil. The resulting red color is caused by the formation of copper oxide.

5. *Proteids.* Put some white of egg in a test tube, and heat slowly. Pour in a little dilute nitric acid. The proteid turns yellow.

Circulation:

1. Examine a sheep's heart and blood vessels obtained from a butcher. (Use formalin solution for preserving.)

2. *Effect of gravity on blood.* Hold the right arm above the head, and let left arm hang down. Notice color. Reverse hands.

3. Locate the veins on the back of the hand or arm and apply pressure. Note the valves.

4. Indicate hemorrhage from a vein and mark with blue chalk; a hemorrhage from an artery marking with red chalk. Arrange tourniquet in proper position for each case.

5. Study a drop of blood under the microscope.

6. Wind a string rather tightly about the forefinger of the left hand, beginning at the base. When the end of the finger is reddened and distended with blood, make with a sterilized needle, a quick, sharp, light puncture near the base of the nail. This ordinarily brings a small amount of blood. Remove the string and watch the drop of blood. Note that at first it is perfectly liquid, but later it becomes jelly-like, *i. e.*, it coagulates. Later still observe that a clear or slightly yellowish liquid oozes from it. This yellowish liquid is the serum. What is left is the clot. After the serum has evaporated, the clot dries and forms a scab.

Respiratory System:

1. Obtain lungs of sheep from butcher. Slit open the bronchi to show the lining.

2. Open the larynx and observe the vocal cords.

3. Test lung capacity by means of a spirometer.

4. *Breathing exercises.* Show three types: pectoral, diaphragmatic, and abdominal.

Respiration:

1. Study throat with a hand glass — with back to the light. Note the teeth, tongue with papillæ, roof of mouth, whether high or low, broad or narrow, the fauces and tonsils and the soft palate.

2. Breathe on a mirror and note the expired air. Note moisture.

3. Breathe in a glass of lime water through a tube. Note the white cloud due to carbonate of lime.

4. Breathe on a thermometer. Note result.

5. Note quiet breathing. Watch the parts that move in deep breathing. Place the hands on front and sides of chest, waist, and abdomen. What motions?

6. Observe and record the rate of breathing in the horse, cow, dog, and cat. Is air drawn more quickly in, or out of the nose? Is there a pause? If so, when?

7. Count the respirations for one minute of a person sitting quiet. Repeat twice, and take the average of the three.

8. Count the respirations of a person who has been actively exercising, as running upstairs or playing tennis, baseball, etc.

9. Count the respirations of one who is lying down, but not asleep. Count again when the same person is asleep.

10. Count the respirations before and just after a meal.

11. Compare the rate of respiration in different individuals who are apparently in the same condition as regards exercise, mental excitement, eating, etc.

12. Note dust in the air through a beam of sunlight.

Air:

1. Breathe into cup of lime water a few times through a tube. The carbon dioxide in the breath joins with the lime to form calcium carbonate — the water turns a milky white.

2. Let dishes of lime water stand an hour in a well-ventilated room and also in a poorly ventilated room. Note the resulting milkiness.

3. Demonstrate artificial respiration.

Alcohol:

Into each of three tumblers place one inch of soil in which several seeds of corn have been planted. Fill the first tumbler with beer, the second with a mixture of one third beer to two-thirds water, and the third with pure water. Cover each with glass, place in a warm, light room (not in the sun) and observe germination.

PART TWO.

COMMUNITY HYGIENE.

COMMUNITY HYGIENE

PART TWO

I.— DISEASE AND GERMS

Disease.— In ancient times and during the middle ages men thought that disease was a punishment from the gods for man's misdeeds; or that evil spirits had taken up their abode in the body and must be driven out by spells and incantations.

The fact that each and every disease is produced by a germ was not discovered until 1876 by Dr. Louis Pasteur of France. He first proved that anthrax, a disease of cattle, was due to a little rod-like plant in the blood, so small as to be seen only under a microscope. Since then, the germs of the following diseases have been found and identified: typhoid fever, diphtheria, pneumonia, lockjaw, influenza, erysipelas, cholera, the plague, tuberculosis, cerebro-spinal meningitis, and others. The germs of measles, whooping-cough, scarlet-fever, smallpox, and mumps have not yet been found, but probably will be in the near future.

Germs, Microbes and Bacteria belong to the vegetable kingdom and they are the smallest living things we yet know about. They live either upon dead tissue or upon the degenerate tissue of living plants and animals.

Useful and Pathogenic Bacteria. — About 95% of bacteria are useful. Such bacteria destroy dead tissue, restoring it to the soil and air again; they are necessary to the formation of soil; they help to purify the water in the earth; they cause milk to sour; they help to make cheese

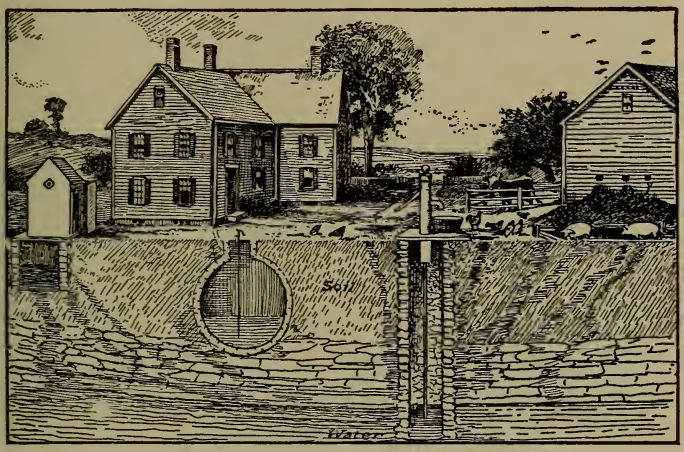
FIG. 95. — Types of germs. From left to right, top row:—Pus, Tuberculosis, Tetanus; bottom row:—Pneumonia, Diphtheria, Typhoid.

and butter, and aid in many other useful and necessary organic changes.

Bacteria multiply either by simply dividing in half, or by giving off little round bodies called *spores*, which grow and become adults. Spore cells have a hard, tough wall which makes them harder to kill than disease germs. Most bacteria grow best between 70° and 95°. Hence foods difficult to preserve, especially milk, meat, and eggs, have to be kept in an ice-box, at lower temperatures

than these, so that germs will not grow. Direct sunshine or boiling water at 212° will kill germs, but not spores.

About 5% of bacteria, called *pathogenic*, are detrimental to the health of human beings. They are really parasites, feeding upon the cells in the human body and excreting poisons called *toxins*, which circulate in the blood and



DANGER OF CONTAMINATION TO CISTERN AND WELL WATER FROM SURFACE DRAINAGE OR FROM ENTRANCE OF FILTH AT TOP.

have a bad effect on the tissues. The germ diseases are called *infectious* because they are readily passed along from one person to another. Such diseases as smallpox, scarlet-fever, measles, etc., the germs of which may be carried in the air and breathed, are called *contagious*. The two terms are now used interchangeably.

The *non-infectious diseases*, such as diabetes, rheumatism, alchoholism, and various inflammations of different organs,

are due to derangements in the working of these organs and the perverted work of certain cells.

More people die from infectious than from non-infectious diseases. If, then, we can prevent the growth of germs, or their entrance into the body, we may save many lives.

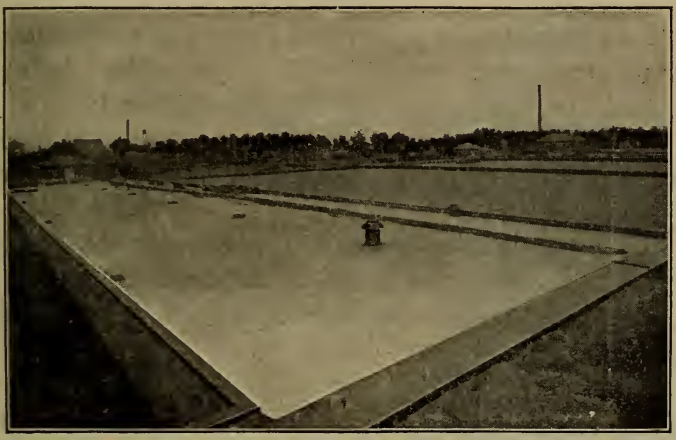
Some diseases are due to animal parasites such as malaria, trichinosis, hook-worm disease, dysentery, and others.

How Disease Germs enter the Body.— Germs enter the body in many different ways, causing diseases of many different kinds; for instance:

1.	By drinking infected water and milk:	causing typhoid fever.
2.	By breathing infected air:	causing tuberculosis, smallpox, scarlet fever, measles, pneumonia, diphtheria, colds.
3.	By using unclean or infected drinking-cups, knives, plates, forks:	causing tuberculosis, diphtheria, influenza, mumps, tonsilitis.
4.	By cuts and other open wounds:	causing blood poisoning from pus-germs, lockjaw.
5.	By infected discharges on hands, and under finger-nails, being carried to the mouth:	causing typhoid fever, cholera, dysentery.
6.	By bites of insects (mosquitoes, flies, fleas, bed-bugs):	causing malaria, yellow-fever, sleeping sickness, plague.
7.	By bites of animals:	causing hydrophobia, snake-poisoning.

How Germs may Be Killed. — 1. By direct sunshine and fresh air.

An abundance of sunshine renders a place almost free from disease germs. Sunlight destroys germs, partly by drying the food upon which they live and partly by its own chemical action. In some hot and dry places as in the Sahara and the Great American Desert, decay is almost



FILTER BEDS OF THE INDIANAPOLIS WATERWORKS.

Here the water from White River is purified by filtering through layers of sand, gravel and perforated tile.

unknown, for bodies become dry before the germs can grow. Darkness, decay, and disease go hand in hand. Fresh air and wind tend to carry germs away. Diseases are rarely transmitted in the open air, but in badly ventilated rooms and especially in sick-rooms, where the germs collect in great numbers and not only re-infect the patient but endanger all who enter.

2. By great heat and by boiling water. A substance

made free from germs is said to be "sterilized." This condition may be effected either by dry heat in an oven or by boiling. Boiling for ten minutes will kill all germs, but not all spores. These latter have often to be subjected to a higher temperature or to disinfectants to become sterile. All clothes and utensils used in a sick-room may be sterilized by boiling. Before operations all instruments are boiled, and the dressings subjected to a dry heat to sterilize them.

3. By the action of drugs called germicides or disinfectants. Disinfectants are chemical agents which destroy germs. The following are the most generally used:

For disinfecting rooms, formalin and sulphur are used, as these when vaporized come in contact with every part of the room and its contents.

For clothes, bedclothes, towels, instruments, etc., a 5% solution of carbolic acid is the best disinfectant.

For discharges from patients, chloride of lime is much used.

For disinfecting the hands and for washing wounds, bichloride of mercury, 1 part to 1,000 parts of water, is the best. It must be remembered that bichloride destroys iron and tin; therefore it must not be kept in vessels made of these metals, or used for instruments.

Antiseptics are drugs which have a mild action on germs. They *retard the growth* but do not actually kill them all. Examples: Boracic acid, oil of eucalyptus, etc.

Typhoid Fever is caused by the typhoid germ. The germ gains entrance to the body through food and drink. About three-fourths of all cases are caused by infected water and one-fourth by infected milk. A few cases are due to

raw oysters coming from waters infected by sewage. Food is often infected by flies. The danger of this disease may be greatly lessened by screening all windows and doors, keeping flies away from our food, by drinking pure water and pure milk, and by using clean drinking vessels. Boiled water or milk is absolutely safe. Filtered water will keep back about nine-tenths of the germs. A *filter* consists of layers of coarse sand and gravel. Small house filters should be cleaned daily and boiled once a week. In cities using sand filters there is only about one-fourth as much typhoid as formerly.

A GOOD HOUSE FILTER.

Impure milk may be due to dirty cans, or to washing milk cans with dirty water, or to the unclean hands and clothes of those who work around the cow stables.

Impure water from rivers and wells is caused by the water being contaminated with sewage in some way. In the little town of Plymouth Pa., there was a notable outbreak in 1885. Out of a population of 8,000, there were 1,100 cases of typhoid fever from the drinking water. On investigation it was found that the source of the stream which supplied the drinking water was polluted by one case of typhoid, in a house on a hill above the town where no sanitary precautions had been taken. It cost the town $8,000 for a hospital and estimating for loss

of time, wages etc., the total cost of the outbreak was about $67,000.

Many Diseases are Carried by Insects.—As stated, typhoid fever and tuberculosis are carried by flies. Mosquitoes carry malaria and yellow fever. Fleas and bedbugs carry the plague.

House-flies or typhoid flies as they are sometimes called are very dirty insects. They breed in incredible numbers in

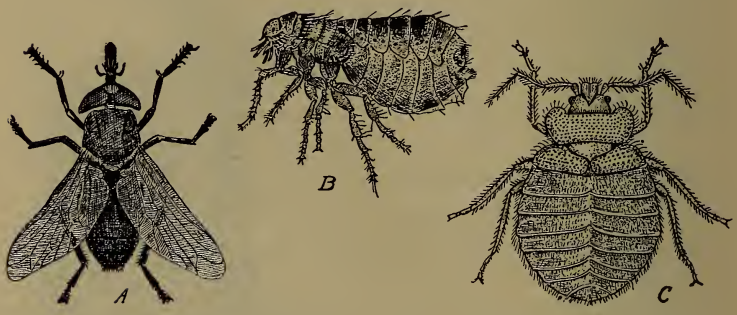


FIG. 96.—*A*. Cadfly. *B*. Flea. *C*. Bedbug.

horse manure or in the dust of houses. Twelve hundred house flies, at least, will issue from a pound of horse manure. Ten days completes a generation in the summer, and the number of eggs laid by each female averages 120. Flies swarm in kitchens and dining-rooms where food supplies are exposed. In this way food is frequently infected with many diseases. To get rid of them, stables and houses should be screened; food should be covered; and houses kept thoroughly clean so as to leave no breeding places for the eggs. The box-privy which is common in country districts should have its contents covered with lime

every three or four days or, better still, with earth, each time it is used.

Garbage cans should always be covered; they should be emptied daily and scrubbed frequently with a broom and boiling water.

Malaria. — This disease is not caused by a germ, but by an animal parasite in the blood. It was discovered in 1880 by Laveran, but it was not until 1898 that Ross discovered

FIG. 97.—House-fly and Larva.

the mosquito as the host. The symptoms of malaria are chills, fever, and sweats. The malarial parasite breeds in a certain variety of mosquito only, and in the act of biting the mosquito deposits the eggs in the blood of the person bitten. These parasites attack the red blood corpuscles, grow quickly to the adult stage, and then break up into more eggs. The production of the eggs is marked by chills in the patient. Fever follows as the result of poisons in the blood, the red blood corpuscles are rapidly destroyed, and the person becomes very pale and anæmic. The mosquito breeds in low, swampy places, in stagnant water, contain-

ing no fish or frogs. The young are called *wigglers*, and must come to the surface to breathe.

The malaria mosquito is the species *Anopheles*. It differs from the ordinary mosquito, the *Culex*, in two respects: it has spotted wings and its body is held out straight while the insect is biting. In the ordinary mosquito the body is held at right angles while biting.

Night air was formerly thought to be harmful, because people who were much in it developed malaria. We now know that the malaria was not due to night air, but to the bite of the mosquito, which is most active by night.

FIG. 98. — The harmless mosquito on left. On right the *Anopheles*, or mosquito that carries malaria.

Prevention of Malaria. — The beds of malarial patients should be screened from mosquitoes; houses should be screened; all stagnant pools, ponds, and swamps should be drained to prevent the breeding of mosquitoes. Old tin cans, buckets, or tubs should not be allowed to remain half full of water; pools should be stocked with fish and frogs to devour the young wigglers. If kerosene is poured on the surface of stagnant water it will form a thin film, through which the wigglers cannot breathe. One ounce

is sufficient for fifteen square feet of surface. This last precaution should be taken twice a month.

Yellow Fever.—This is caused either by a germ or a minute animal organism. This organism is carried by a certain kind of mosquito known as the *Stegomyia Calopus*. Yellow fever usually exists in low, swampy places. The method of prevention is the same as for malaria. Previous to the occupation of Havana by the United States, that city was called the graveyard of the white man; now, yellow fever is almost unknown there. In 1900 our War Department appointed an Army Commission, consisting of Doctors Reed, Carroll, and Lazear, to investigate yellow fever in Havana. All three allowed themselves to be bitten by mosquitoes which had previously bitten yellow fever patients. All became infected with yellow fever and, though they lived to see their theories proved, they eventually succumbed to the disease. In grateful memory of these martyrs to science, the Government has erected a monument to them in Washington, D. C., for through their sacrifice thousands of lives have been saved.

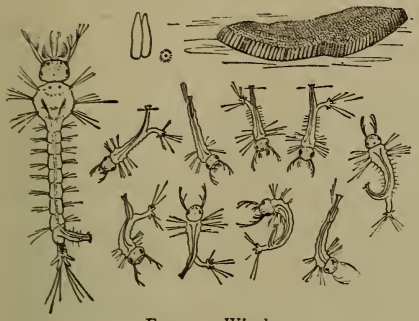


FIG. 99. Wigglers.

FIG. 100.— The mosquito that carries yellow fever.

The New Orleans outbreak of yellow fever in 1905 was quickly stopped by anti-mosquito measures. It is conceded that more than four thousand lives were saved in the city that season by the intelligent application of measures based upon the methods of the United States Army surgeons in Cuba in 1900 and 1901.

The Canal Zone and Sanitation. — The Panama Canal proved a failure under the French, because most of the workmen died of malaria and yellow fever. Now, under the supervision of the United States Government, the houses are screened, towns and villages kept as clean and sanitary as possible, breeding pools covered with kerosene, and the building of the canal has become possible. Not a case of yellow fever has been reported for some time in the Canal Zone.

If this Canal should serve no other purpose than that of an object lesson in sanitation, it will be worth to the United States and the civilized world far more than its total cost. In the report of the Sanitation Department of the Isthmian Canal Commission in March, 1911, it is indicated that the Canal Zone, formerly swept by disease and pestilence, but now policed by General Gorgas and his sanitary inspectors, is about the safest place in the world to live. Of white employees and their families there are about 10,000, — a population equivalent to that of an average American city — among whom in that March there were only ten deaths. Of these ten, only two died from a preventable disease (pneumonia). The other eight were the result of accidents and unavoidable diseases.

No such result in the elimination of disease has ever

before been established or even dreamed of. Yet, as good results could be secured in every community in the United States if the intelligent, painstaking, and scientific methods of General Gorgas and his subordinates were only adopted.

A STREET IN PANAMA, SHOWING THE INSANITARY CONDITIONS PREVAILING UNDER FRENCH ADMINISTRATION OF THE CANAL.

The world has been shown that preventable disease is the result of ignorance and indifference, and that in view of our present knowledge of the causes and methods of prevention of disease, its continued existence is discreditable to modern civilization.

The Great "Black" or Bubonic Plague is not only carried by rats and mice, but very often by fleas and bedbugs; and this latter mode of infection must be reckoned with in all preventive methods.

Pellagra, a disease common in Italy and in Georgia, now spreading through our southern states, is characterized by

A STREET IN PANAMA UNDER THE ADMINISTRATION OF THE UNITED STATES GOVERNMENT SHOWING IMPROVEMENTS IN SANITATION

a peculiar eruption of the skin, especially of the hands and arms, and certain disorders of the digestive and nervous systems. The latest theory of its introduction into the human body is that the disease is carried by a blood-sucking gnat called the Simulium fly, which lays its eggs near

running streams. It was formerly thought to be caused by a fungous disease in corn.

The Sleeping Sickness, common in Africa, is now known to be carried by the tsetse fly. Anthrax, a disease of cattle, is carried by gadflies or horseflies; and Texas fever, a disease of cattle, is communicated by the common cattle tick.

In Egypt and the Fiji Islands there is a destructive eye disease carried by the common house-fly, while in our southern states a disease called *pink-eye* is caused by a very minute fly.

Animal Parasites. — There are several diseases in man produced by minute animal parasites finding their way into the blood. Such diseases include hydrophobia, trichinosis, uncinariasis or "hook-worm disease," malaria, yellow fever, and the sleeping sickness. Malaria, yellow fever, and the sleeping sickness have already been considered.

Hydrophobia usually results from the bite of a mad animal, *i. e.*, one suffering from a disease called *rabies*, the minute organisms of which are in the saliva. Persons affected should immediately undergo the Pasteur treatment, which is a vaccination for hydrophobia. The animal should not be killed, but held in restraint and under observation to ascertain if rabies is actually present.

Trichinosis is a disease resulting from eating uncooked pork containing an animal parasite called the *trichina spiralis*. The disease is very painful, but not necessarily fatal, if the proper treatment is instituted at once.

Uncinariasis or "hook-worm disease," which is widely prevalent among the "poor whites" throughout our south-

ern states, is now known to be caused by a tiny worm in the blood. The eggs, or larvæ, are in the surface soil, where they attach themselves to the bare feet of the mountaineers, and thence by contact, find their way to the hands, the mouth, and the alimentary canal. This disease produces an intense anæmia, which largely accounts for the hitherto notorious "shiftlessness" and laziness of these unfortunate people. This disease is easily cured however, by modern treatment, as has been abundantly demonstrated by the U. S. Medical Corps in Porto Rico, where more than 50% of the entire native population were sufferers from this disease.

II.—TUBERCULOSIS.

Tuberculosis is caused by a rod-shaped germ, called the tubercle bacillus, discovered by Dr. Robert Koch, a German physician, in 1881. Tuberculosis is called the Great White Plague, because it kills more people than all the other infectious diseases combined. In the United States alone it kills four hundred people daily. The germ multiplies very rapidly; for example, in twenty-four hours one germ will produce ten million.

Causes Which Favor Contraction of Tuberculosis.—1. Tubercular patients are likely to give the disease to their children very early in life because of the close contact in the home circle; especially is it communicable in kissing.

2. *Dust.* Street dust is full of bacteria from the dried sputum of those who expectorate in the streets.

3. *Closed, badly ventilated rooms* catch and hold the dust containing the germs. Foul air lowers the resisting power of the lungs to the germs.

4. Anything which causes *shallow breathing* may be said to favor tuberculosis such as tight corsets, belts or collars, adenoids, chronic inflammation of any part of the respiratory tract, producing colds, bronchitis, pleurisy, pneumonia.

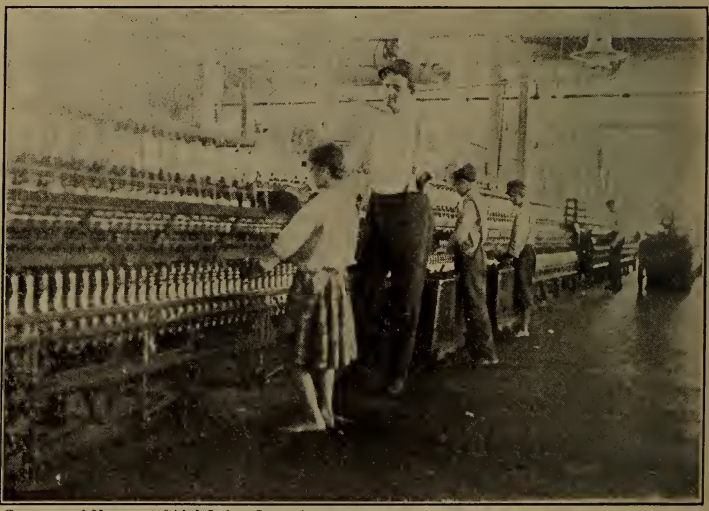
5. *Sedentary occupations.* Such occupations as require sitting indoors; those, for example, of clerks, bookkeepers, stenographers, dressmakers and milliners.

6. *Dusty occupations*, as those of coal-miners, stone-

Courtesy of National Child Labor Committee.

BREAKER BOYS IN A PENNSYLVANIA COAL COMPANY.

(The youngest said he was thirteen, but this was doubtful.)



Courtesy of National Child Labor Committee.

YOUNG SPINNER IN A MISSISSIPPI YARN MILL.

(She said she was thirteen.)

cutters, glass-workers, janitors, street-cleaners and factory workers, especially in cotton or wool. It frequently happens that those who work out-of-doors, sleep in such badly ventilated rooms that they often contract the disease; as, for instance, the fishermen of Labrador.

Most people who contract the disease are overworked, and underfed, and get little fresh air or sunshine. Tuberculosis is common in dark, close, tenement-house districts. No child, is ever born with tuberculosis, but a tendency to the disease may be inherited. The germ may be taken into the body, not only with inhaled dust, but, by the mouth and alimentary canal from contact with infected drinking-cups, tooth-brushes, knives, forks, etc., and also by eating the meat and drinking the milk of infected cattle.

Parts of the Body Commonly Attacked. — This disease may attack any part of the body, but the parts most commonly attacked are the following:

1. The lungs.
2. The bones and joints in children, as in hip and spine disease.
3. The lymph glands in the neck producing a disease commonly known as scrofula.
4. The membranes covering the brain and spinal cord, producing cerebral meningitis and spinal meningitis.
5. The intestines, kidneys and skin.

Symptoms. — Usually the first noticeable sign is a progressive loss of weight and strength. There is a slight rise in temperature every afternoon or evening. Later a cough with expectoration may develop. The disease is generally painless, except for the spasms of coughing. If the disease

WHERE THE CHILDREN PLAY IN A CROWDED TENEMENT DISTRICT.

begins first in the vocal cords of the larynx, the only symptom is a hoarse voice. Hoarseness is suspicious if it lasts longer than three weeks, and the patient should go to a throat specialist at once for examination.

Duration of the Disease. — Tuberculosis generally lasts several years. There is one form, however, called "galloping consumption" which may kill in a few weeks or months.

CHARACTERISTIC ADVERTISEMENTS OF "CONSUMPTION CURES."

The Cure of Tuberculosis. — The cure for tuberculosis is fresh air, sunshine, good food and rest. Sometimes these remedies can be procured at home, but it is better, if possible, to go to a Sanatorium or open-air hospital. Here the tubercular patient is taught how to care for himself. He is given only the proper food to eat, including plenty of milk

and eggs; he takes the required amount of rest and gets all the sunshine and fresh air possible, spending the entire day in the open air and sleeping out at night. On returning to his home he is supposed to go on with this treatment and not relapse into his old unhygienic way of living. In this way the Sanatorium is an educational institution. Proper care of this kind in the *first stage* will cure more than one-half of all the cases of tuberculosis. All cases might be cured if they could only be taken in time. This is why the early recognition of the disease is so important.

Medicine Is of Minor Importance.— Medicine is of no use unless combined with fresh air, rest, good food, and sunshine. Patent medicines are a delusion. There are about five hundred of these "Consumption Cures" on the market, all claiming to cure tuberculosis, but as there is no known drug which will accomplish this end, they are frauds and should be studiously avoided. "Consumption Cures" are cruel, for they deceive the consumptive into thinking he is better, because of a temporary stimulation resulting from the alcohol in the remedy, while in the end the progress of the disease is actually hastened, since alcohol lowers the resistance of the body to disease. Morever, much time is lost in using them which should have been spent in securing proper treatment.

Care of the Consumptive at Home. — Some people cannot go away to a Sanatorium, but must be cared for at home. To obtain out-of-door sleeping, many devices have been invented; one may sleep out on a porch or in a tent in the back yard or garden.

The best place in a city is the roof of the house, as the air

is purer there than near the ground. Window-hoods for either the outside or inside of bedroom windows may be used, by means of which the patient's head is practically out of the window, while the body is in the room.

Sometimes people have a morbid fear of the consumptive, an attitude which is cruel as well as ridiculous. If the proper precautions are taken, there is little danger of contracting the disease from living in the same house with the

SLEEPING QUARTERS ON A CITY ROOF.

consumptive. As the greatest danger lies in the sputum, the use of paper cups and handkerchiefs to be burned after using is a necessary precaution, while the dishes used at the table should be scalded immediately after using.

Preventive Methods. — The disease is contracted by coming in contact with the germs which are always found in the sputum of tubercular patients. Flies may feed on the sputum, and then, carrying thousands of tubercular germs,

walk over food which is exposed on the table. Tubercular sputum must therefore be collected and destroyed. For this purpose there are on the market various kinds of paper cups and paper handkerchiefs, which may be used to collect the sputum and then burned. If linen handker-

Courtesy of the National Association for Prevention of Tuberculosis.
EVEN AT NIGHT, THE PATIENT BREATHES ONLY OUTDOOR AIR.

chiefs are used, they must be thoroughly boiled. Tubercular patients should be warned not to cough or sneeze on other people.

The Public Drinking Cup. A campaign against the public drinking cup is now in progress. Kansas was the first state to abolish its use, while Michigan, Wisconsin,

Mississippi, New Jersey, New York, and Illinois have since fallen into line.

The use of such a cup is an antiquated custom, as well as both distasteful and unhygienic. People do not wear public clothes, eat from public plates or smoke public cigars. Why, then, should they drink from public cups?

Bacteriologists have made microscopic examinations of

VARIOUS KINDS OF PAPER DRINKING CUPS.

public cups collected from schools, hotels, railway stations, and stores, which have been found to be infected with various kinds of pus germs from boils and abscesses, and germs of diphtheria, pneumonia, and tuberculosis.

Many public institutions, such as banks, department stores, schools, etc., have installed the bubble fountain, which does away altogether with the use of a cup. The individual drinking cup is the next best in hygienic useful-

ness. It is a stiff paper cup, purchased at a slot machine for one cent. There are also on the market folding paper cups which can be carried in an envelope. Much can be done by the use of such cups in eliminating many of the infectious diseases.

Fresh Air Schools for tuberculous children were inaugurated in Chicago in 1910. These children were below grade, made little progress, attended irregularly and gave their teachers much trouble. After six or eight months in the new school, the children came regularly, were wonderfully improved in health, and became good students. Recently in 1911, such a school has been opened in Philadelphia in a roof garden. The children arrive at 8 A. M., and spend the entire day; being provided with their breakfast, dinner and supper. Not only are these children taught the usual school branches but time is found for rest, games, and bathing; and the serving of nourishing food. Much should be accomplished by such a movement, and if successful the Board of Education will probably provide for many such schools.

A HYGIENIC DRINKING FOUNTAIN.
(*It helps to diminish contagious diseases.*)

Courtesy of The Survey. FRESH AIR SCHOOL AT PROVIDENCE, R. I.

Courtesy of the Survey. TUBERCULOSIS OPEN-AIR PREVENTORIUM AT LAKEWOOD, N. J.

III.—VACCINATION AND ANTITOXINS.

Vaccination was discovered in 1798 by Dr. Edward Jenner, an English physician. It consists in the inoculation of a person with the germs of cowpox. *Inoculation* is the injection of some substance under the skin. *Immunity* is that condition of the body in which it is proof against a disease.

Cowpox is a weak form of smallpox as it is found in the cow. If the germs of cowpox are inoculated, the blood of the person so inoculated forms bodies called antitoxins, which fight not only the cowpox but also the smallpox.

Conditions Previous to Vaccination. — Smallpox was at one time one of the most common causes of death. Almost every person over thirty years of age had had it, many of whom were left blind and deaf. In the eighteenth century, sixty millions died from it in Europe alone.

In the twenty years between 1874 and 1894, Austria, which had no compulsory vaccination laws, recorded 239,800 deaths from smallpox, while Prussia, with compulsory vaccination laws, had only 8,500 deaths. In Philadelphia, Boston, and New York, there were terrible epidemics of smallpox in Colonial days. Now the disease is comparatively rare, many doctors having never seen a case.

In March, 1911, there was published an interesting report on vaccination and smallpox in the Philippines, by Victor G. Heiser, M. D., Director of Health in the Philippines, and

Robert Oleson, M. D., United States Marine Hospital Service. They reported as follows:

"The efficiency of vaccination as a preventive against smallpox has been conclusively and effectively demonstrated since the American occupation of these Islands. During the Spanish rule, it was necessary each year to erect in Manila a large temporary hospital for smallpox and always a majority of the patients died. During the past five years, not one person has died in Manila from smallpox who had been successfully vaccinated during the five previous years, nor has any one died of smallpox in Manila since June 1909. In 1907, systematic vaccination was completed in the six provinces near Manila. These provinces, containing over a million people, have from time immemorial had an annual mortality from this disease of about 6,000 people Since 1907 not one person successfully vaccinated has died from smallpox in the six provinces. Only a few cases have even occurred, and among these there were no deaths in persons successfully vaccinated."

This report should prove a conclusive answer to those misguided persons who, through ignorance, oppose vaccination.

Process of Vaccination. — The arm, or thigh, should be thoroughly cleansed with soap and warm water and a brush, then washed with alcohol, followed by sterilized water. The skin is then gently scratched with a surgically clean knife or needle, not enough to draw blood, but only a clear fluid called lymph. The vaccine is then applied from a tube or a point. A shield is put

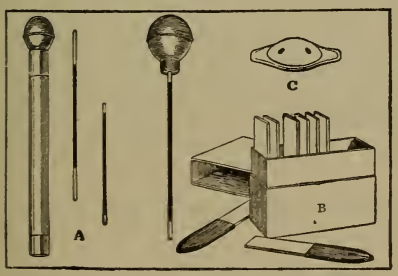


FIG. 101.—(A) Vaccine in tubes. (B) Box of Vaccine points. (C) Shield.

on and, in about a week a small pimple appears, which gets larger, discharging pus for about a week. A third week is allowed for the drying of the scab. The sign of a good "take" is the presence of a few pits in the skin, not necessarily a large scar. During the discharging period, the patient may feel dull and drowsy for a few days. Frequently however there are no special symptoms.

Courtesy of Dr. Jay Schamberg.

APPEARANCE OF NORMAL VACCINATION ON THE SEVENTH DAY.

Vaccination causes immunity for a period of about ten or twelve years. Therefore one should be vaccinated about every ten years but oftener during epidemics.

Vaccination against Typhoid Fever.—It is now possible to vaccinate against typhoid infection. During the Spanish-American War, 1898-9, out of 120,000 men on the field, there were 20,000 cases of typhoid fever with a mortality of 7%. Of all the Volunteers, 90% became infected with typhoid within eight weeks of mobilization.

> "During the outbreak in Mexico in the Spring of 1911, there were 18,000 of our troops called out in Texas and California. These men lived in tents for over two months, in a rain-soaked country where the roads were full of thick mud. By the use of anti-typhoid vaccine, there was but one case in all these troops, and that was a teamster who had not been vaccinated."—*Report of the United States War Office.*

This report shows conclusively the value of this form of vaccination.

Antitoxins are substances formed in the blood to fight

against disease. The use of antitoxins was first discovered by Louis Pasteur, in 1880. He found that by inoculating chickens first with a weak solution of the germs of chicken cholera, and then with a stronger solution, he could make chickens immune to the disease. From this discovery, antitoxins for many diseases have been used with great success. We have antitoxins now for diphtheria, tetanus or lockjaw, tuberculosis, pneumonia, and hydrophobia.

In Pennsylvania the State Commissioner has recently issued the statement that during the year 1910, free distribution of 5,000 unit doses of diphtheria antitoxin instead of the ordinary 3,000 unit doses has lowered the mortality from 8% to 6.61%. The mortality in cases not treated with antitoxin was 42%.

An immunizing dose is a smaller dose of antitoxin than the ordinary used as a preventive. It has no bad effect on the heart, nor does it cause paralysis, but the poisons of diphtheria cause both. Antitoxin is expensive, but in all large cities it may be obtained free from the Board of Health for the use of the poor.

The Pasteur treatment for hydrophobia, a disease produced by the bite of a mad animal, consists in the inoculation of the sufferer with several weak solutions of hydrophobia germs, in increasing doses.

Cattle are now inoculated with *anti-tuberculosis* serum with great success.

IV. — NARCOTICS.

Narcotics. — These are substances which deaden the nervous system. Many poisons such as alcohol and tobacco are stimulants in small quantities and narcotics in large quantities. The narcotic effect is due to the fact that the poison so benumbs the nerves and injures the cells that they are unable to act properly. The stimulating effect comes first, followed by the narcotic effect.

TOBACCO PLANT.

The principal narcotics are alcohol in large quantities, tobacco, opium, morphine, chloral, hasheesh, and many patent medicines.

Alcohol. — The first effect of alcohol is a stimulating one; the heart beats faster and the skin becomes flushed because the blood vessels are relaxed. The narcotic effect is much more powerful. All the faculties are benumbed, and the drinker falls into a stupor, or becomes "dead drunk."

Tobacco consists of the dried leaves of a plant growing extensively in Virginia, West Virginia, Kentucky, and many other parts of the South, as well as in the West Indies. It contains a substance called nicotine, which is responsible

for the bad effects of the tobacco. Two or three drops of pure nicotine will kill a man.

Injurious Effects of Tobacco. — Tobacco smoke frequently causes chronic inflammation of the nose and throat, a hacking cough, or a hoarse voice. The smoke is also very irritating to the lungs. The sense of taste and of smell are both impaired. If there is a tendency toward cancer, the irritation of a cigar or pipe may cause cancer of the lip, tongue or throat.

"Tobacco heart" is indicated by an irregular heart-beat, with fluttering and palpitation.

Chewing tobacco is both a coarse and offensive habit. It discolors the teeth, wastes the saliva, weakens the glands, and irritates the stomach. The poisonous nicotine is absorbed by the mucous lining of the mouth. Chewing encourages spitting, another bad habit, which spreads many kinds of germs throughout the atmosphere.

Cigarettes are much more injurious than pipes or cigars, because the smoke is inhaled. The absorbing surface in the lungs is a hundred times larger than that of the mouth, and the effects of the nicotine are multiplied. Most cigarettes are flavored with drugs which color the fingers of the smoker yellow, and opium is common in cigarettes, increasing the harmful effects. A great part of the craving which cigarettes induce is probably due to the opium.

Pipe Smoking. — As nicotine accumulates in the bowl an old pipe becomes very strong and very injurious, the same being true of the stump of a cigar or cigarette. Sir Henry Thompson says: "The only persons who enjoy smoking are those who smoke in great moderation. Men

who are rarely seen without a cigar between the lips have long ceased to enjoy smoking. They are confirmed in a habit, and are merely miserable when the cigar is absent."

Tobacco and Crime. — It is a well-known fact that a large percentage of the boys who appear in the Juvenile Courts bear the yellow stains on their fingers which indicate the cigarette smoker. Many large corporations, including street and railway companies will not employ men who drink or smoke. Men to be eligible must be physically, mentally, and morally sound, and the man who indulges in alcohol or tobacco does not come under this class. In some states, it is against the law to sell cigarettes to minors, and in other states their manufacture is prohibited.

OPIUM PLANT.

Alcohol and tobacco often go hand in hand. Tobacco produces a dry mouth which demands drink, while alcohol causes a nervous excitement which the tobacco tends to allay.

Opium is a narcotic drug made from the dried milky juice of the poppy plant growing in South Asia. A very small dose is stimulating, but its narcotic effect appears immediately and drowsiness and sleep follow. Opium is used by physicians to relieve pain, produce sleep, lessen hemorrhage, and to quiet the intestines. It should be taken only under and by the direction of a physician.

Forms of Opium. — Opium is found in laudanum, paregoric, and Dover's powder. Morphine is a white powder or alkaloid obtained from opium; paregoric and laudanum are frequently found in teething and soothing syrups for babies.

The Opium Habit.—The main action of opium is on the nervous system, but it acts also on the heart and the alimentary canal. Indigestion in all its forms sets in; the trouble extends to the liver, and the vitality of the whole body is lowered; the skin becomes yellow, the body emaciated, and there is a marked loss of moral tone. A victim of the opium habit will lie and steal to obtain more opium. This drug is more enslaving and more harmful in its effects than alcohol. The only cure is to keep the patient away from the drug. A few weeks' confinement early in the habit will be sufficient; the awful craving for the drug will gradually disappear and health will return.

Opium Poisoning. — The ordinary dose is one grain — four grains will produce death. The signs of poisoning are a deep sleep from which the patient cannot be aroused, very slow breathing, slow pulse, pale and clammy skin, and pin-point pupils.

Treatment: Try to arouse the patient by slapping and pinching; two persons should walk him up and down; shake vigorously and dash cold water upon the face. If the patient can swallow, give an emetic, such as a tablespoonful of mustard in a glass of water. After vomiting is induced, give as much strong black coffee as possible. Call a physician, who will attend to giving such other antidotes and stimulants as may be necessary.

Chloral is a crystalline powder which will also produce sleep. Twenty grains is the dose, and an overdose will produce death. Chloral is sometimes taken instead of opium, and the injurious effects are almost as bad. The treatment for chloral poisoning is the same as for opium.

Hasheesh is the juice of the Indian hemp, or *Cannabis Indica.* It produces a happy delirum with visions of beautiful scenes and persons. The hasheesh habit ruins body and mind in much the same way as opium.

Chloroform is a sweet-smelling liquid, used as a general anæsthetic for surgical operations. A few whiffs of the vapor causes insensibility, which may easily result in death if the patient is not carefully watched. No one should ever smell a bottle of chloroform, for two or three inhalations may render the person unconscious.

Cocaine is a drug which is used to produce local anæsthesia, *i. e.*, a loss of the sense of feeling in any part. It is injected under the skin or applied to the mucous membrane in surgical operations. Cocaine, taken internally, causes a pleasant excitement and persons soon become slaves to its use. When taken in this way it disturbs the heart, circulation, digestion, and nutrition, soon causing death. The cocaine habit is even more terrible than the opium habit, and is often acquired by taking patent medicines or by drinking much of some of the hot weather beverages, popularly known as "*soft drinks.*"

V.— ALCOHOL.

How Alcohol Is Produced. — The most common way of making alcohol is to grow a plant, called yeast, in a liquid containing sugar. The *yeast plant* is a microscopic, one-celled plant, which will grow rapidly in a warm atmosphere. In an hour or two, the growing yeast will separate the sugar into carbon dioxide (shown by bubbles of gas) and alcohol. This process is called *fermentation*.

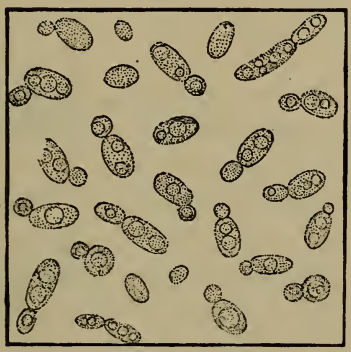


Fig. 101.—Yeast Plants.

Distillation. — When the amount of alcohol in a fermenting liquid equals one-seventh of the solution, it kills the yeast plants and fermentation stops. To get a stronger solution of the alcohol, the first solution must be heated and the vapor from it collected as it is driven off. The vapor is then chilled by cold water which changes it back again into a liquid, thus producing a second solution much stronger than the first. This process is called *distillation*, and alcoholic drinks are called distilled liquors or spirits.

Wood alcohol or *methyl alcohol* is used in the adulteration of cheap whiskies, and in various essences and colognes. When taken internally it causes blindness.

Ethyl or *grain alcohol* is the main constituent of all alcoholic drinks.

Fermented liquors include all wines and malt liquors. Wines are made by the action of yeast on fruits; they contain from 10% to 20% alcohol.

Malt liquors are made from sprouted grain or malt. They include beer, porter, and stout, and contain from 3% to 5% alcohol.

Distilled liquors include whisky, brandy, rum, and gin. They contain from 50% to 60% alcohol.

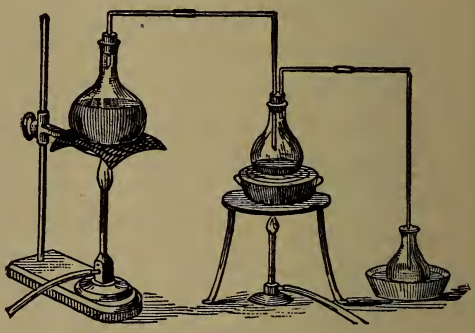


FIG. 103.—Distilling Apparatus.

Many *patent medicines* contain a large amount of alcohol varying from 10% to 40% which gives a temporary feeling of stimulation, but after this wears away, the patient feels worse than before and craves more of the medicine: Thus the alcohol habit is formed.

Effects of Alcohol on the Body. — The main effect of alcohol is on the nervous system. Therefore alcoholism is now classed with the nervous diseases. Death from swallowing a large dose is rare, though it occasionally happens in the case of children.

In acute alcoholic poisoning the main effects are on the heart and circulation. In chronic alcoholic poisoning the heart and abdominal organs are mainly affected.

The effect on the heart and blood vessels is most commonly a fatty degeneration of the muscles of the heart. The arteries become diseased and hardened. Apoplexy and sudden death sometimes result.

Effect on the lungs: Congestion and pneumonia are common and the use of alcohol predisposes to tuberculosis by lowering the bodily resistance.

Effect on the liver: Fatty degeneration usually takes place, or a hardening, with either enlargement or shrivelling of the organ.

Effect on the spleen and pancreas: There is a chronic hardening of both these organs.

Effect on the kidneys: There is congestion and hardening, with a tendency to a disease of the kidneys, called Bright's disease.

Effect on the stomach: All forms of indigestion and gastritis.

Effect on the nervous system: Alcohol destroys the nerve cells. It produces congestion and inflammation of the brain, cord, and nerves. The first symptoms are a weakening of the will and a degeneration of the moral nature with untidiness, slovenliness, failure to keep promises, and loss of responsibility in caring for the family. Alcoholics lose all sense of shame· they are irritable, and are subject to sudden fits of anger, in which children are often cruelly punished for some trifling fault. Conceit, profanity, and immorality mark the drunkard's downward course. Mental degeneration may go on for years, until the victim of alcohol becomes a nuisance and a burden to the community. Alcoholics are more liable to injury and succumb more readily to infectious diseases, especially pneumonia and tuberculosis,

from which many die as, also, from delirium tremens and apoplexy.

Alcohol as a Medicine. — Alcohol is sometimes used as a temporary stimulant in cases of fainting. Aromatic spirits of ammonia, however, is better. Formerly alcoholic liquors were kept in many homes for use in sickness, but now educated people know that they are of but little or no value as medicine.

Alcohol as a Food.—There is some dispute with regard to this point. In some wasting diseases a very small quantity may be burned up in the tissues and thus retard tissue waste, but even this use is attended with risk, as the alcohol habit may result.

Children of Alcoholic Parents.—Such children inherit a weakened and unstable nervous system, which makes them liable to excess in all things. Many come into the world either feeble-minded or idiotic, and epileptic fits are common among them. The children of alcoholics are usually small in stature, and of weak muscular development. They are prone to disease and many die in infancy.

Prof. Demme of Stuttgart studied the cases of ten families of drunkards and ten total abstinence families for ten years, with the following results:

	Drunkard's Family	Total Abstainer's Family
Number of children	57	61
Died before six weeks of age	25	5
Idiots	6	0
Stunted growth	5	0
Epilepsy	5	0
Nervous during childhood, but cured	0	6
Ordinary good health during childhood	17.5%	81.5%

Occupations which Tend to Induce Alcoholism.—Persons engaged in occupations which require mental strain, worry, excitement, and irregular hours tend most toward alcoholism, as for instance, journalists, actors, book-keepers, clerks, and stenographers. A monotonous existence is another factor favoring alcoholism. Occupations alternating between hard work and periods of idleness, especially in large cities, also tend to form the habit, as in the case of bricklayers, carpenters, masons. Laundresses and cooks, dressmakers and milliners are more likely to drink than those working in factories and shops. During strikes, there is a great increase in drunkenness, in both men and women.

Alcoholism is more prevalent in males than females, though the latter take to it earlier. Women are more quickly poisoned than men, because men, by reason of heavier muscular work, burn up more alcohol and thus escape some of its poisonous effects.

Drinking in moderation is a relative term; moderation for one, may be excess for another. Many moderate drinkers may use alcohol throughout a long life, while others, after a short period of drinking, find their bodies permanently injured.

Relation of Alcoholism to Poverty and Crime.—Alcohol and poverty and crime go together. Monotonous labor, long hours, and poor and insufficient food tempt the laborer to drink in order to forget his miserable existence. Drunkenness in turn causes more poverty, which causes more drunkenness, and thus a vicious circle is formed.

Alcoholism in destroying character, blunts the sense of right and wrong so that crime comes easily to the alcoholic.

An examination of the records of state prisons, reformatories, and houses of correction, will easily show the large proportion of cases due to alcohol. No other offense causes so many arrests in the police courts, and a large percentage of the number of inmates in hospitals for the insane is due directly to alcoholic insanity. England reports one-half her crimes due to strong drink; Russia one-fourth due to the same cause.

Loss to the State through Alcoholism.— Education of the public, mainly through the public schools, has done much toward reducing the amount of alcohol used in America. Still, however, immense quantities are consumed yearly although it is easily proved that poverty, crime, and disease are nearly all caused by alcohol. The evil results are so great as to be almost incredible. The time lost to honest labor through sickness and suffering, through imprisonment for crimes, through detention in hospitals for the insane and in almshouses, could be estimated in millions of dollars, to say nothing of the homes broken up, the characters ruined, and the bodies destroyed.

VI. — PATENT MEDICINES.

A patent medicine, a quack medicine or secret nostrum is one composed of drugs, the names or quantities of which are known to the manufacturer only. The composition of such medicines is kept secret so that the profit made from the sale of the remedies may accrue to a certain person or firm. This does not conform to the code of ethics adopted by the medical profession at large. The really great discoveries in the medical world have been given freely to the public; *i. e.*, vaccination for smallpox, the use of ether and chloroform as anæsthetics, antitoxins for certain diseases, such as diphtheria and cerebro-spinal meningitis. In these cases the public has only paid for the actual cost of the remedies, while the doctors who discovered them gained nothing from their discoveries but the glory and the gratitude of succeeding generations.

The *patent medicine business* in the United States is one of large proportions. It is estimated to-day at seventy-five millions of dollars, wholesale, and one hundred millions retail. Of this amount about forty millions go to the newspapers and journals for advertising purposes. There are at least five patent medicine concerns which expend one million dollars annually for advertising.

Excessive Profits in Patent Medicines. — Most patent medicines are made of cheap ingredients and are sold at

large profits. Many have been investigated by the American Medical Association and by the Government, which have been found yielding a profit of from 100% to 500%. For instance, some very common patent medicines selling for one dollar a bottle cost from six to fifteen cents to manufacture. Many contain little but water and some coloring matter, while others are made of the most ordinary household remedies.

The Worthlessness of Patent Medicines. — The only evidence of good accomplished by patent remedies is the claims of the manufacturers and their testimonial letters. We cannot accept the formulas on the bottles, as the statements may be false. Most of the letters, too, are fraudulent. On investigation, a certain commission found that in many cases, the persons in whose names these letters were written were dead; in other cases, the addresses were false; and in still others, the letters contained inaccurate statements or downright lies.

LETTERS FOR RENT

300,000 Jas. Wm. Kidd medical file cards representing all kinds of diseases (will sort) 1904.
180,000 men's matrimonial, 35,000 women's '04, 1st.
200,000 agents and canvassers.
50,000 Dr. Pierce order blanks, '02,'03,
20,000 Ozomulsion order blanks, '03.
30,280 Theo. Noel,'02, '03, medical file cards.
59,000 Agents' directory, '03, '04, '05.
250,000 Home work, '03, '04, '05.
27,500 Rosebud trust, firsts, '03, '04.
19,500 Bond Jewelry payups, trust, '04,envelopes.
52,000 10c song orders, Star Music Co., '04, '05.
17,500 Dr. May & Friar, ladies' regulator '03, 04.
6,000 Nervous debility, '03, '04, Appliance Co.

Over 1,000,000 letters on hand, all kinds. Call or write me for samples and ads. Letters bought.

MEDICAL

MEDICAL. 5,000 Dr. Stevens & Co. Columbus, Ohio. Nervous debility.

MEDICAL. 2,000 L. West, Avon, N. Y. Nervous debility, first replies.

MEDICAL. Dr. Pierce Order blanks 50,000; 1902, '03.
MEDICAL Ozomulsion. 20,000, 1903.
MEDICAL. 30,280. Theo. Noel file cards. 1902-'03.
MEDICAL. 24,500, Physician's Inst. and Edson France. Women's, 1903.

7,000 first replies late 1904.

13,000 late '02-'03-'04 letters in answer to above ad.

TWO ADVERTISEMENTS IN RECENT PERIODICALS.
WHAT IS LIKELY TO BECOME OF YOUR "SACRED CONFIDENCE."

Testimonials. — One of the most disgraceful and disgusting features of the patent medicine business is the marketing of letters sent by patients under the seal of "sacred confidence." Only one letter in a thousand reaches the doctor to whom it is addressed. These so-called confidential letters are opened by men and women clerks who are paid salaries for just this work. The letters are sorted and certain previously typewritten answers are mailed as answers. The letters are then turned over to letter brokers, who dispose of them to other patent medicine firms for various sums, ranging from one-half to five cents per letter. In a certain magazine may be seen such advertisements as the following, showing, all too plainly what becomes of the letters written in confidence:

> "For sale, 7,000 paralysis letters, 9,000 narcotic letters, 5,200 consumption letters, 300 cancer letters, 6,500 deaf letters."

Harm Wrought by Patent Medicines. — The results of patent medicines are often sad and cruel. For instance, there is no known drug which will cure either consumption or cancer, and yet there are on the market hundreds of so-called "Cures" for both these diseases. The precious time wasted in taking these remedies often makes it too late, after the patient realizes that he has been swindled out of health and money, to use the proper treatment. Then, also, some of these cures have a temporary stimulating effect, often due to the alcohol in them; false hopes are raised for a brief time, but soon the patient becomes worse and the awakening to this fact is pitiable.

Harmful Drugs in Patent Medicines. — *Alcohol* is found

in most of the general tonics, nerve tonics, stomach bitters, and medicinal foods, the percentage ranging from 10% to 45%. (Compare this with the percentages in the alcoholic drinks — malt liquors 3% to 5%, wines 10% to 20%, and distilled liquors 50% to 60%). Many people have become thoroughly addicted to alcohol through the use of patent medicines, and especially is this true of women.

Opium in various forms, chloral, and chloroform, are found in cough mixtures, colic mixtures, soothing and teething syrups. Thousands of babies have been killed by soothing syrups given to them by ignorant mothers.

Cocaine is generally found in asthma cures, cold cures, catarrh powders, hay fever remedies, etc. It is very easy to form the cocaine habit, which, as already stated, is as harmful and perhaps more dreadful in its results than the opium habit.

FIG. 104.—Percentage of alcohol in patent medicines as compared with that in alcoholic beverages.

Acetanilide is a coal tar product found in most headache remedies. This drug is very depressing to the heart and will permanently injure it; it is also harmful to the blood.

The habitual use of headache powders is now very common, especially among girls and women, and people who depend on them find they cannot do without them. Acetanilide gives only temporary relief by depressing the nerves and, when the action wears off, the original headache returns.

Remedy for this Evil. — The question is often asked, "Why do patent medicines seem to be so successful?" The answer lies in the fact that the sick are always hopeful. They are always willing to try new cures; they

EXAMPLES OF PATENT MEDICINE ADVERTISEMENTS.

believe the testimonials, so many of which are fraudulent. The repeated and continued advertising of patent medicines has the effect of making people believe that there must be some good in them. The manufacturers of these remedies often advertise great honors conferred on them by certain colleges and societies, which upon investigation are found to be non-existent or swindles. Many reputable papers, magazines and even religious journals, knowing patent medicines to be frauds, continue to give them advertising space, because of the liberal sum paid by the companies for advertisement. To remedy this evil:—

1. The public must be educated. This may be accomplished by lectures, books, newspapers, magazine articles, and instruction in the schools.

2. People should stop buying patent medicines.

3. The public should withdraw patronage from papers and journals that advertise patent medicines.

4. Better laws should be enacted, prohibiting or limiting the manufacture and sale of these remedies.

The Food and Drugs Act, which went into effect June 30, 1906, is good as far as it goes. It simply requires, however, that the percentage of alcohol and dangerous drugs used in any patent medicine be printed on the label; it does nothing whatever to limit the manufacture of the remedy. Much remains to be done in this direction as many people do not take the trouble to read the labels, and many more are ignorant of the poisonous effects of some of the ingredients.

VII. — PUBLIC WORK.

Lockjaw and the Fourth of July. — *Tetanus* or *lockjaw* germs grow in the earth, shut off from the air. They reach the body through wounds — especially wounds in the feet. In 1903 the first report of Fourth of July fatalities was published by the Journal of the American Medical Association. In that year 466 persons were killed and 4,000 injured as a direct result of the celebration. Of those killed, 400 died from lockjaw, the germs being blown in with dirt, dust, and powder. Of those injured, many were made blind for life, some had their fingers, hands, arms, and legs torn off, and were otherwise mutilated. Since 1903 public sentiment has gradually been turning against this method of celebrating. Magazines, newspapers, and clubs have taken the matter up, and towns and cities have legislated against it, with such splendid results that the movement is now nation-wide. This change means the saving of thousands of lives, the prevention of thousands of accidents, and the saving of millions of dollars' worth of property from fire. Instead of a hideous nightmare of noise and discomfort, we now look forward to a safe and sane celebration which will develop respect for law and order as well as genuine patriotism.

Boards of Health. — In every large city and town there is a *Board* or *Bureau* of *Health;* and in every small town or village there are certain persons whose duty it is to

guard the health of the community. These officers must see that the laws are enforced which provide for the prevention of sickness and the spread of infectious diseases; they must see that houses containing infectious diseases are placarded with a conspicuous notice; that the inmates are quarantined and the house disinfected after the patient has

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PUBLIC SENTIMENT IS FOR THE SAFE AND SANE FOURTH.

recovered. They are also responsible for a pure water supply and a pure and clean milk supply. They must see that garbage and sewage are properly disposed of, and that dead animals are removed from streets and lots; that houses have proper plumbing, and that people are clean. They must inspect dairies, slaughter-houses, markets, etc., and collect statistics as to births and deaths,— the latter

being called vital statistics. The Bureau of Health also controls the tenement districts in large cities; and, in general looks after all things that tend to influence the health of the community.

The Department of Street Cleaning should work in conjunction with the Board of Health. Waste paper, skins

DISINFECTION OF CLOTHING AT A QUARANTINE STATION.
Steam or formaldehyde gas is turned into the great steel tubes in which the wire cases of clothing are placed.

of fruits, etc., should never be thrown into the street; nor should stores and houses be swept into the street.

Physicians and people in all walks of life should endeavor to work with the Board of Health in promoting the health and happiness of the general public, and never work against them by trying to outwit them or breaking the rules.

Quarantine Stations.—These are established at all ports of entry into this country. Each immigrant is examined by the quarantine officers and by this method all persons suffer-

ing with infectious diseases or dangerous chronic diseases, as well as the insane and the idiots, can be detained and, if necessary, deported. Ships containing cases of infectious disease are held in quarantine and fumigated, while all persons on board are held for a certain length of time to determine if any more cases will develop among them. In this way our country is protected from many diseases and from such severe outbreaks as have occurred in the past of cholera, plague, and smallpox.

Sanatoriums.—These are open-air hospitals, which may be under private or State management. Such institutions are for the treatment of tuberculosis, nervous diseases, drug habits, etc. Many states have established sanatoriums for the open-air treatment of tuberculosis. In Pennsylvania there is one at White Haven and another at Mount Alto, while throughout large cities there are *Free State Dispensaries* for the examination and treatment of all poor tuberculous patients.

Hospitals.—These are buildings for the care of the sick. All cases of accidents and emergency illness of any kind may be sent to a hospital by calling the ambulance of that hospital or a police patrol. For the benefit of the very poor there are *dispensaries* of all kinds in every hospital, where a doctor's advice and medicine may be obtained free or for a very small sum. In large cities these dispensaries have been very much abused by people who can afford to pay. It is the general rule in most hospitals that every physician and surgeon gives his or her time free in the hospital dispensary service for the poor. People should therefore not use the dispensary unless they are absolutely unable to pay a doctor.

VIII. — EMERGENCIES.

First Aid to the Injured. — Any one who is able to render assistance to the injured is a valuable person in the community. It is often impossible to get a physician immediately and in many emergencies it is the treatment during the first five or ten minutes which determines the fate of the patient.

Fainting. — This is due to a lack of blood in the brain. If the fainting occurs in a roomful of people, carry the person outside before beginning the treatment. Lay the patient flat on the floor or on a bench. Loosen the clothing about the neck and waist and open all doors and windows to insure fresh air. Bathe the face with cold water and give aromatic spirits of ammonia to inhale. A half teaspoonful of the aromatic spirits of ammonia in some cold water may be administered, or hot milk given to sip. Only a few people are needed to care for the patient. Do not crowd around, but go away if you cannot be of service.

Burns. — If the clothing should catch fire *do not run.* Lie down on the floor and roll over and over. To assist another person, wrap him in a thick coat, a rug or a blanket and roll him on the floor. When the flames are put out, moisten the clothes with warm water and clip them away. Never tear the clothes off. Blisters may be opened with a clean needle which has been passed through a flame.

Burned surfaces must be kept from the air by using some greasy substance, such as vaseline or oil. *Carron oil* is made up of equal parts of linseed oil and lime water. A moist paste of baking-soda or plain lime water takes the sting out of a burn, or a cloth saturated in a solution of salt (one teaspoonful to the pint of water) may be used with

FIRST AID TO THE INJURED IN A FIRE ACCIDENT.
(*Note that one of the injured has fainted.*)

great relief. Do not put cotton on a burn, but use old, clean linen cloths, gauze or pieces of lint.

Wounds. — Allow them to bleed freely, as bleeding washes out any dirt which may be present. Wash with cold water or, if procurable, a solution of carbolic acid, one teaspoonful to a pint of water. Draw edges of cuts together

with adhesive plaster and bandage the wound. For bleeding, apply ice or *very hot water*.

Bruises or Contusions, — Bathe with very hot water to reduce the swelling. The hot water also helps to rid the skin of the discoloration due to broken blood vessels under the surface.

CLOSING THE EDGES OF A CUT WITH ADHESIVE PLASTER.

Hemorrhage.—For nosebleed, do not lie down; sit up in a chair. Hold the nose tight with one hand, and with the other, make pressure along the upper lip. Apply ice to the throat and back of the neck and ice-cold cloths to the nose.

When an artery is cut the blood is bright red and spurts with each heart-beat. Blood from a vein flows continuously and is a dark purplish color. Make pressure on both sides of the wound, if possible. Tie a handkerchief tightly about the wound; run a stick through the knot and twist it to get greater pressure. This is what is called a *tourniquet*. The large arteries are found on the inside of the arm and leg and back of the knee. Raise the bleeding part if possible, and make pressure against the bones.

SURGEON'S KNOT.

Sprains. — Raise the part; apply cracked ice in a towel, or hot water. Do not apply liniment or massage until the swelling begins to go down.

Fractures or Broken Bones. — Keep the part at rest as much as possible. Fashion splints out of an umbrella, walking-stick, a roll of newspapers, a branch of a tree or a fence-rail and tie on both sides of the limb with handkerchiefs above and below the fracture. If necessary carry the person carefully, until a doctor can be reached.

FIRST AID SPLINT DRESSING AND BANDAGING OF BROKEN ARM.

Dislocations. — Support the part; apply cold-water compresses. Pull on the part; the pulling may reduce the dislocation, but if not, it generally relieves the pain.

Frostbite. — When any part of the body is frostbitten it becomes white and numb. Never take the sufferer into a warm room. Stay in a cool room or out-doors and rub the part with ice or snow. The inflammation and subsequent itching will be relieved by a solution of carbolic acid — one teaspoonful to a pint of cold water.

Sunstroke. — In cases of sunstroke the face is very red and the skin hot and dry. Carry the patient into the shade.

Apply ice all over the body, especially to the head, and keep the patient quiet.

Heat Exhaustion. — This condition is shown by a pale face, and a skin cold and moist to the touch. Put the patient in bed with blankets and hot-water bottles, and give stimulants and hot milk. Never apply ice and do not give alcohol.

Drowning. — Recent experiments by Prof. Schaefer of Edinburgh, have shown that death is due not to water in the lungs but to heart failure. (*See page 116 for Method of resuscitation.*)

Suffocation by Illuminating Gas or by Coal Gas.—Carry the person into the fresh air and begin artificial respiration as in drowning. (*See page 116 for method of resuscitation.*) Use smelling salts; apply a mustard plaster to the stomach and massage to the body generally.

Intoxication. — This may be caused by too much alcohol in liquors or in patent medicines. The patient is semi-conscious, the breathing heavy, the face purple, and the eyes bloodshot. There is an odor of liquor in the breath. Give an emetic to empty the stomach, then give strong, black coffee and put to bed.

Bites of Animals. — The bites of all animals should be cauterized, either with pure carbolic acid or a red-hot instrument. If the animal is supposed to be mad, the physician should arrange to have the patient vaccinated for hydrophobia. This is called the Pasteur treatment. An animal supposed to be mad should never be shot, but should be confined and kept under observation by a veterinary surgeon to ascertain whether hydrophobia is present or not. To overcome the struggles of such an animal, satu-

rate a cloth with ether or chloroform and drop it over the animal's head, covering it again with a coat. The animal will soon become unconscious.

Bites of Poisonous Snakes. — Poisonous snakes in the United States include the rattlesnake, the copperhead, and the water moccasin. A bite from any one of these usually results in death in a few hours. The wound may be sucked if there is no abrasion of any kind on the lips or mouth, and the poison spit out on the ground. If the bite is on a limb, apply a tourniquet above the wound as tightly as possible, to prevent the circulation of the poison. Every twenty or thirty minutes the bandage may be slightly loosened, to allow a small quantity of the poison to escape into the circulation. The wound, which will show two small spots from the poison fangs, may be cauterized or may be freely opened so as to let out the poisons in the blood and lymph. Whisky and brandy as anti-toxins are now no longer recommended by the best authorities. A strong solution of permanganate of potash is the best remedy for neutralizing the poison. This may be applied to the wound, or better still injected around the wound by a hypodermic syringe. Many of the Canadian and Rocky Mountain guides now carry this remedy and the hypodermic case for use in snake bite.

Fig. 105.—Hypodermic Syringe

Bites of poisonous insects, such as mosquitoes, bees, wasps, and hornets, cause considerable pain and swelling but are not dangerous to life. Bathe in ammonia water or apply a paste of baking-soda.

Choking. — Any foreign body lodging in the throat may be dislodged by a smart blow between the shoulder-blades, which will cause a blast of air to rush out from the lungs. Fishbones can often be carefully pulled out by a pair of forceps. If a pin should be swallowed, do not administer a purgative, but give a diet of mashed potatoes, bread, and hard-boiled eggs until the pin is passed by way of the rectum. This method prevents any injury to the intestine, by surrounding the swallowed object with a mass of soft material.

Croup. — In young children croup shows itself by a hard, brassy cough, generally at night. Place the child without delay in a hot bath, or apply mustard plasters to the abdomen, and give an emetic, such as a teaspoonful of syrup of ipecac.

Fits or Convulsions.—These are of many kinds: 1. The *epileptic fit* is recognized by the patient's crying out and then falling unconscious. He moves his arms and legs aimlessly, bites his tongue, froths at the mouth and seems to be in pain, but in reality he is not suffering at all. Keep the patient lying down and quiet; place something in the mouth to prevent biting the tongue. Do not attempt to give any medicine. The attack is followed by a long sleep.

2. A *stroke of apoplexy* usually comes only to the elderly. The face is purple, the breathing very loud and harsh, the person unconscious. Make the patient sit up and keep the neck straight. Apply ice to the head and heat to the feet. Call a physician at once.

3. *Hysteria.* In a hysterical attack the patient is semi-

conscious and the arms and legs may become very stiff and blue. Throw cold water on the head and face and speak very sharply. Do *not* sympathize.

4. *Spasms in children* are caused by teething and indigestion. Put the child in as hot a bath as he can bear, apply ice to the head, or mustard plasters to the abdomen. Give a soapy water injection to move the bowels.

Poisons. — For all poisons but acids and alkalies, give an emetic. An emetic is a substance which, when taken into the stomach, causes vomiting. Some common emetics are: Warm mustard water (one tablespoonful in a glass of water) followed by a quart of warm water; warm salt water, made in the same way. Tickling the throat with the finger or a feather hastens the desired results.

Acids. — If there are stains or burns on the mouth or hands do not give an emetic but give immediately the antidote for an acid, which is an alkali, such as baking-soda, chalk, or soap.

For *carbolic acid* give oil or milk, first; then, a tablespoonful of Epsom salts in a glass of warm water as an antidote.

Arsenic is found in Paris green, rat poison, etc. In arsenic poisoning give an emetic and afterward plenty of milk and eggs.

Phosphorus is found in the heads of matches. In phosphorous poisoning give magnesia or chalk in water, followed by white of egg.

In opium poisoning the person affected goes to sleep and cannot be awakened. Walk the patient up and down, slapping and pinching him. Give black coffee. (*See page 207.*)

Poisons from mushrooms (*toadstools*) *berries, etc.*, may generally be treated by an emetic, followed by a purgative. Never eat strange berries, leaves or roots, as there is always danger of poison.

SOME POISONOUS MUSHROOMS.

Showing the "veil of death" around the stem, the "poison bulb" of the root, the "leprous spots," the irregular or closed "gills." Any mushroom having one or more of these characteristics is surely poisonous, but *not all* of those without them are edible.

In the case of susceptible persons, certain trees and plants, such as poison-oak, poison-ivy, sumach, etc., will cause a poisoning of the system indicated by a rash of blisters with intense itching, and in some cases swelling. Poison-ivy may be distinguished from Virginia creeper by the leaves having but three parts instead of five.

Washing the face and hands with plenty of soap and leaving the lather on, will often allay the itching at once. If not, try pure grain-alcohol.

POISON VIY.

If the swelling and rash do not yield to this treatment, or if the eyes show the least sign of infection, a physician should be consulted at once.

One of the strangest things about poison-ivy is that, while some persons are so susceptible that merely being in the vicinity or to windward of the plant is sufficient to produce the rash and swelling, others may handle the plant with apparent immunity. The safest plan, however, is to learn to recognize the plant and then to avoid it.

PART THREE

THE REPRODUCTIVE SYSTEM

THE REPRODUCTIVE SYSTEM

PART THREE

I.—PHYSIOLOGY OF THE REPRODUCTIVE SYSTEM.

Sex Hygiene treats of the health of the reproductive system, and of the influences which make or mar the perfect working of its various organs. It is intimately connected with all the other systems of the body, the general health of the individual depending very materially on the condition of the reproductive organs.

Sex Organs. — The sex organs in the girl are the uterus and ovaries, all located deep down in the pelvis between the bladder and rectum. The *ovaries* are two small, solid organs, each one about the size of an almond, and composed of thousands of little egg cells. The *uterus* is a hollow, pear-shaped organ, lying between the ovaries and connected with them by two tubes, one on either side.

Menstruation. — Various synonyms are used to denote menstruation; as, monthly sickness, period, being unwell, the menses.

Menstruation is a periodic discharge of blood from the uterus and vagina occurring about every four weeks, and lasts from three to six days. Once a month, an egg cell becomes detached from one of the ovaries. It passes

through the connecting tube into the uterus, there causing so much congestion that a flow of blood follows. This blood passes from the uterus through a passage-way called the *vagina*, and is expelled from the body. This entire process is called menstruation. It is established in girls at about fourteen years, in the beginning of the period of life called puberty, which lies between fourteen and twenty years of age. The periods recur until the age of forty or forty-five years, the termination being called the *menopause*, or change of life. Menstruation is established earlier in city girls, and in girls who live in hot climates.

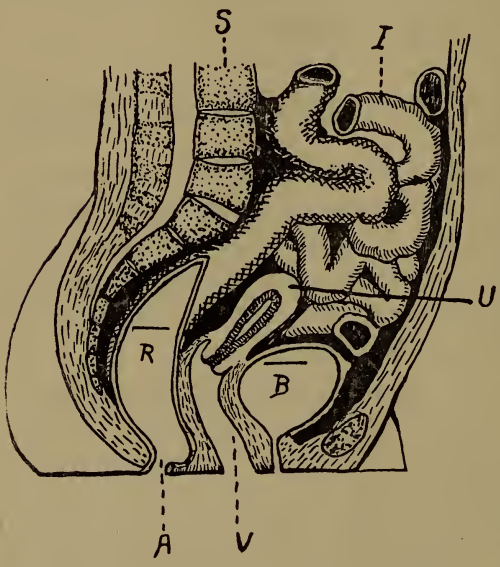


FIG. 106. —Female reproductive organs in longitudinal section of the body. *A*, anal opening; *B*, bladder; *I*, intestine; *R*, rectum; *S*, spinal column; *U*, uterus, *V*, vagina.

After the establishment, the flow may be irregular for a year without giving cause for alarm, provided the general health is good. At the end of a year, however, if it is not regular, a physician should be consulted.

When a girl begins to menstruate regularly, a change gradually comes over her. She looks different and she is

different. She begins to put away childish things (her dolls, for instance) and to assume more womanly ways.

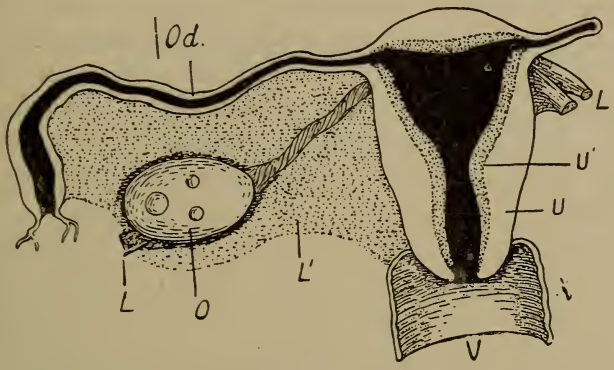
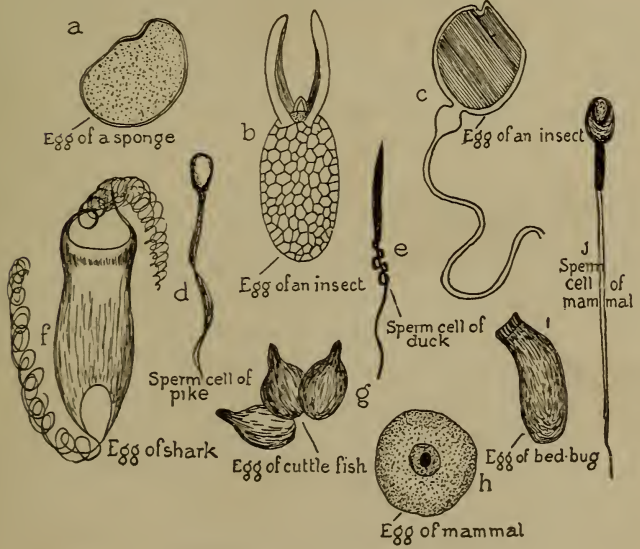


FIG. 107.— Female reproductive organs. (*Front sectional view*). *V*, vagina; *U*, uterus; *L*, supporting ligaments; *O*, ovary; *Od*, oviduct.



VARIOUS FORMS OF EGGS AND SPERMS.

Until a girl has menstruated, she has no assurance that she is a perfect individual. Menstruation is the promise to her of possible motherhood. It ought to make a girl very happy to know that when she becomes older and marries, she will be able to bear a baby of her own, to love and to train, and she should never forget that the health of that future baby depends a great deal on the care she takes of her own health, especially during the years of puberty.

II. — HYGIENE OF THE REPRODUCTIVE SYSTEM.

As menstruation is a perfectly natural process, a healthy girl should have no pain when the flow appears. The *general symptoms* are a dull, heavy feeling in the lower abdomen; slight backache, and general discomfort.

Unfortunately, there are few perfectly healthy girls and women, so that all sorts of complications afflict many girls soon after puberty. Some of the *special symptoms* are sick headache, severe pain, drowsiness, nausea and vomiting, diarrhea and increased nervousness.

The Flow. — At first, the flow is pale, then red, then pale again. There should be no clots. Sometimes there is a white discharge just before and after the flow. If this becomes very profuse, or continues between periods, consult a physician.

Care during the Period. — The extra need for blood in the uterus during menstruation makes this organ a little heavier than usual, and takes blood away from other parts of the body. This is a physical drain on the system each month which requires some hygienic consideration. For her own protection and future good health, every girl should at this time rest a few days. If this is not possible the daily activities should be lessened. Taking a purgative the day before, and keeping the bladder well emptied, will render this trying time a little more comfortable. Avoid chilling of the body, vigorous exercise, and heavy

work, — especially lifting. Long walks, dancing, skating, sea-bathing, gymnasium work, riding horseback or a bicycle should be omitted. Exposure to cold, as in sleighing or coasting, is unwise; also, exposure to rain or dampness. There should be freedom from worry or excitement, and a reduced, plain diet. Rest an hour in the afternoon, and if the pain is very bad the first day, go to bed.

For severe headache accompanied by pallor take aromatic spirits of ammonia, thirty drops in cold water, and place a hot bottle at the back of the neck.

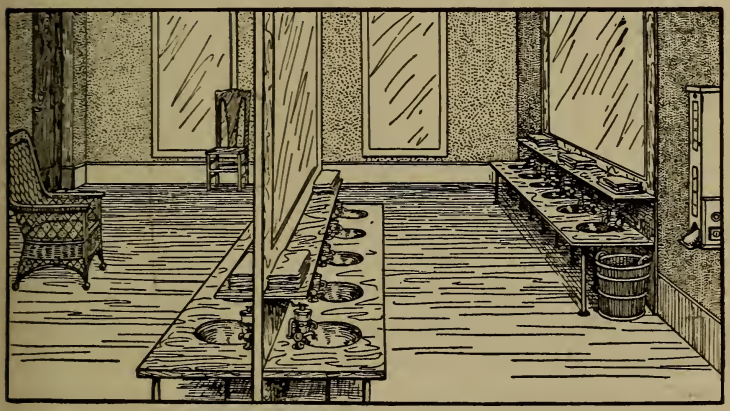
In case the flow should stop suddenly, go to bed and take hot drinks; apply mustard plasters to the back and abdomen, and hot-water bottles around the waist.

Mental Work during Periods. — Mental work should be lightened as much as possible during the flow. Intellectual brilliancy is often won at the expense of a sound body. The blood supply which should go to the building up of a vigorous body is often perverted from its natural channels in the zeal of an ambitious girl to stand high in her classes, perhaps spurred on by her parents or friends. The too active brain steals the blood and energy which should be used for the development of the reproductive organs. In such a girl, the bust is flat and undeveloped, the body thin and angular, the hair scanty, and menstruation is apt to be painful. Under such conditions, all study or school work should be curtailed or stopped entirely, for six months or a year, until a readjustment can take place.

Bathing during Periods. — It is particularly important to keep the body clean at such times. For this purpose, a daily warm sponge bath and a dry rub with a towel is

sufficient. At least bathe the parts every night. Do not take a tub bath in hot or cold water, as the hot bath will increase the flow and the cold bath may stop it entirely.

Sanitary Napkins. — Two or three napkins daily should be worn. The material should be soft and of good absorbent qualities. One of the simplest and best is of cheesecloth, wrapped around a pad of cheap, absorbent cotton. When it is soiled, it can be burned, thus saving the expense of laundering. A material that washes well is the ordinary bird's eye diaper cloth, used in making diapers for babies. The napkin should be fastened securely to a waist



WOMEN'S DRESSING ROOM IN R. R. STATION OR DEPT. STORE.
(*Note the slot machine at the right with sanitary napkins.*)

band; it should be so fastened as to be easily removed, and should be changed often enough to insure comfort and to prevent a disagreeable odor, which too often can be detected on girls who are not particular about their persons.

Keep the napkins in a bag by themselves, in a closet where no one can see them. Before sending them to the wash, soak them in cold water containing a handful of washing soda. Never leave them about and never make menstruation a subject of conversation.

In emergencies sanitary napkins may be bought from a slot machine for five cents in all large department stores, railway stations, theaters, restaurants, etc. If absolutely necessary to change in a public dressing room, always hand the soiled napkin to the woman attendant; never throw it down the toilets.

Public Water-Closets. — If it is necessary to use a public toilet, be very careful not to come in contact with the seat. A sheet of clean toilet paper may be spread on the seat; a better plan is not to sit down at all. Unfortunately every one is not clean or healthy and many diseases, some of them very disastrous in their after effects, may be contracted from the use of public toilets.

A Bad Habit to Form. — Some girls get into the habit of taking hot whisky, brandy or gin for painful menstruation, even up to a stage of semi-drunkenness. This habit is mentioned only to be emphatically condemned, as both unwise and unnecessary. Many widely known patent medicines, advertised for painful menstruation, afford relief for the same reason — the high percentage of alcohol contained. Pain is overcome at the expense of sobriety and too often the alcohol habit is thus formed, unconsciously.

Scanty Menstruation. — Scanty or delayed menstruation may be caused by general ill health, acute illness, latent

disease, anæmia or poor blood, confinement indoors, lack of exercise, exhausting mental work or study, poor food, etc. The remedy for this condition lies in the building up of the body. Sunshine, fresh air, nourishing food, exercise, and plenty of sleep are the chief requisites for gaining increased vitality.

Painful Menstruation. — This condition is generally the result of girls not knowing how to care for themselves at the very beginning of this period of sexual activity.

Constipation is a frequent cause. Waste material collects in the large bowel, which if not evacuated every day, causes pressure on the blood vessels and nerves supplying the sexual organs. The normal and best time for a free evacuation of the bowels, as stated before, is immediately after breakfast, and such a habit should be formed early in life.

Improper attitudes in standing or sitting will cause all sorts of curvatures in the spinal column, such a condition being shown by a low shoulder or a high hip. This lack of symmetry causes unequal pressure on the nerves supplying the sex organs, and this mechanical interference of itself is sufficient to cause painful menstruation.

The pressure of tight corsets on the abdominal organs causes them to be pushed downward so that their weight falls on the reproductive organs which are situated low down in the pelvis. Girls frequently complain of *side ache*, a dull pain in the soft part of the side, just above the hip bone. This pain is generally due to the sore, bruised end of a floating rib, which is demanding more room. These results of tight lacing largely account for the dragging feeling and the weary backache common to many women, especially during menstruation.

Excessive Menstruation. — This is generally due to the causes described under painful menstruation. The daily program during the month should be carefully considered and so changed as to be less vigorous and exhausting. As the period approaches, bodily activities should be lessened, and during the period, rest on a couch or in bed is imperative especially during the first day or two.

Sometimes the over supply of blood to the sexual organs is due to the excitement and emotional state brought on by reading sensational stories of love and passion, and by allowing the mind to dwell too much on thrilling and romantic episodes. We can control our thoughts and keep them pure and clean just as we can control the kind of books we read and the friends we select as our daily companions.

Masturbation. — The secret of beauty lies in purity. Every girl wishes for beauty of face and grace of body. In the development of a girl during the years of puberty, the ovaries secrete a fluid called an "*internal secretion*," which is concerned in the great change of the girl into a woman. It transforms the thin, awkward, scrawny little girl, with flat chest, skinny arms and scanty hair into a graceful young woman, with abundant, glossy hair, rounded bosom, rosy cheeks, sparkling eyes, and fine figure.

The loss of this vital fluid means the loss of health, beauty, and womanly charm, and is a very great calamity. Sometimes, because of irritation in the outer sexual organs, or because of the promptings of an impure-minded playmate, a girl will handle or play with these delicate organs. Such improper handling is called masturbation, and any

such excitation causes the vital fluid to flow from the ovaries and be lost. The effects on the body and mind are marked, for Nature punishes wrongdoing with a heavy hand, — in this case by loss of health, strength, and beauty, with great injury to the nervous system, while the whole moral tone is lowered. Even after this dangerous habit is broken, it is many months before the body can be wholly restored to its normal condition. Insanity not infrequently results from this practice.

Friendships. — In choosing girl friends, select those who are sweet, natural, and refined in both manners and conversation. Never choose one who whispers things that "You must not tell your mother," but rather choose that girl who makes a friend and confidante of her mother. Anything not fit for a mother's ears is certainly not fit for her daughter's.

It is better to have many friends rather than just one special friend. Two girls sometimes have "secrets" which make mischief later. It is better to sleep at home, and not make a practice of spending the night with other girls, who sometimes talk of things they would not mention except under the cover of darkness. If a girl has a group of friends, there is less likelihood of unwise familiarity at any time.

Choose for boy friends those who are intelligent, manly, and jolly, but never familiar. Let them understand they are to be good comrades, not sweethearts. They should be invited to a girl's home to see her when they can also meet her father and mother. Never be guilty of following after a boy; let him do the seeking. The one great rule to be observed in dealing with boys is "Hands

Off!" Be good chums, but never permit anything even approaching familiarity, much less kissing and hugging. No girl will ever be sorry for keeping strictly to this rule. Boys may try to overcome a girl's scruples, but in their hearts they respect and admire and honor in their conversation the girl who respects herself and keeps them at a proper distance.

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